FACTORY

BETTER PRODUCTION AND MAINTENANCE THROUGH BETTER MANAGEMENT

DECEMBER 1959

PRICE ONE DOLLAR

A McGRAW-HILL PUBLICATION

1960 MANUFACTURING AUDIT p. 50

Measures plant progress in methods and technology

THIS INSPECTOR IS A PIGEON ..... p. 70

CHART YOUR WAY TO BETTER MAINTENANCE ..... p. 148

SEE WHY
LQ600®
PAYS ITS OWN WAY IN MAINTENANCE SAVINGS

One look at the precision-machined alloys in the LQ-600 Valve helps explain its maintenance-saving performance. Seats and discs are made of Brinalloy®, the exclusive Lunkenheimer alloy that actually outwears 500 Brinell Stainless Steel or Case-Hardened Stainless exceeding 1000 Brinell. Add Stemalloy®, the most durable stem material ever put into a valve, and you have the two big reasons why LQ-600's are setting new standards of performance everywhere they are installed.

Compare this performance to any other valve in its class. Call your Lunkenheimer Distributor for a test installation . . . or write The Lunkenheimer Co., Cincinnati 14, Ohio.

LQ600-150
150 lb. S.P.
300 lb. W.O.G.

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200 lb. S.P. 550° F.
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FREE Piping Practice Wall Chart on Valve Selection, Installation, Maintenance

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LUNKENHEIMER®
THE ONE *Great* NAME IN VALVES

L-658-5

For more facts circle 446 on READER SERVICE CARD

B.F.Goodrich

V belt briefs

TIPS ON THE CARE, MAINTENANCE AND SELECTION OF V BELTS FOR INDUSTRY

Belts that go straight live longer

When V belts enter and leave the pulley grooves at an angle, it causes the sides of the belts and pulley sidewalls to wear excessively. This condition can be caused by drive shafts that aren't parallel, by sheaves that are out of line, by wobbly sheaves, or by a bent drive shaft.

Simple instructions on how to make sure that the drives are parallel, and to check for wobbly sheaves or bent drive shafts can be found in the B.F.Goodrich V belt maintenance manual. Ask your B.F.Goodrich distributor for a copy.

What do V-belt sizes mean?

V belts are marked with a letter which indicates their width across the top and a number to indicate their length. Standard belt widths are coded: A, B, C, D and E.

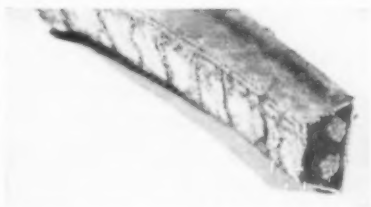
Here are the belt cross sections and minimum recommended pitch diameters to obtain maximum V-belt life.

Section	Recommended Range of Small Sheave Diameters (Inches)	Absolute Minimum Pitch Diameter (Inches)
A	3.0" to 5.0"	2.6
B	5.4" to 7.5"	4.6
C	9.0" to 12.0"	7.0
D	13.0" to 20.0"	12.0
E	21.0" to 28.0"	18.0

Which is the right way to install V belts?

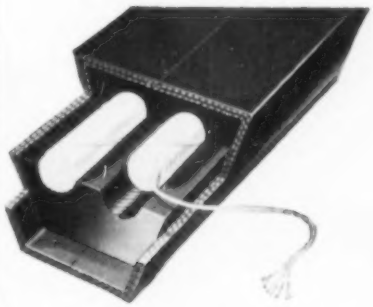
V belt at left is not being installed correctly. When a belt is forced into the sheave with a screwdriver or any other wedge, the outer fabric is often ruptured and cords broken. To install V belts correctly, move driver unit forward so belts can be slipped easily into sheave groove without damage.

What caused this V belt failure?



Answer: There could be several causes: Severe back bend idlers, improper storage, or excessive ambient operating temperatures. To prevent, check storage conditions. If back bend idler cannot be avoided, figure number of belts again with additional service factor. (See B.F.Goodrich Multi-V belt handbook.) Avoid ambient temperatures over 150°.

Here's why Grommet belts grip better



See all the rubber surrounding the twin grommets in this B.F.Goodrich belt? It has more rubber in relation to belt size than any other belt. Grommets are cord loops made like twisted cables, except they are endless. Because these grommets are endless, have no stiff overlapping cords, they are more flexible, grip the sheaves better. Size for size, Grommet belts give ⅓ more gripping power with less slip.

Ask a factory-trained specialist

For help in selecting V belts for any kind of service, call the man who is a specialist in V belts—your B.F.Goodrich distributor. He can help you cut costs by getting longer life from your V belt drives. *B.F.Goodrich Industrial Products Co., Dept. M-754, Akron 18, Ohio.*

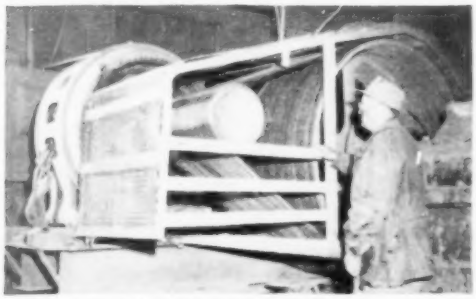


Photo courtesy of West Virginia Brick Co., Charleston, W. Va.

Mixing clay for bricks batters V belts—Dust, dampness and terrific shock loads were wearing belts out in a hurry at this brick plant. The belts drive a machine which mixes thick clay and extrudes it as bricks. Because B.F.Goodrich belts were giving good service on other installations, the plant superintendent tried them on this machine. That was over 1½ years ago. Belts are still going strong, show little wear, required a minimum of maintenance.

B.F.Goodrich V belts

FACTORY

DECEMBER 1959

THE MAGAZINE OF PLANT OPERATING MANAGEMENT

Edited exclusively for the men with management responsibilities for production and maintenance in the manufacturing industries

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FEATURES

Six Plants Work Together as One 42

Here's managed modernization at its best. At Pitney-Bowes aisles and manufacturing lines knife through six buildings as though they were one new structure.

FACTORY'S 1960 Audit Guide for Manufacturing 50

The research is original, the findings revealing. It's a yardstick against which any plant's progress in methods and technology can be measured.

Big Company V.P. Takes Aim at 1960 Costs 59

In this exclusive interview, Westinghouse Manufacturing Vice President Donald C. Burnham speaks out on plant problems plaguing all manufacturers.

New Weapon for Plant Troubleshooters 64

A new electrical diagraming system from General Motors Technical Section saves plenty of time and money. Evaluation comments by non-GM experts.

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Here's Easy-Way Job Scheduling ***67***
This new template and table system, developed by G-E, makes shop scheduling a snap.

This Inspector Is a Bird ***70***
With a peek and a peck pigeons inspect paint on small manufactured parts.

Work Sampling in Maintenance ***72***
At United Air Lines it has increased productive activity 43% in two years.

Chart Your Way to Better Maintenance ***148***
Watching the trends pays off handsomely for the stockbroker. A similar practice can mean more profits for you by helping to schedule crews more effectively.

As FACTORY goes to press:

THE STEEL TALKS: WHERE THEY COLLAPSED -- WHAT'S THE SOLUTION?.....68
An inside report on the crippling struggle, by Washington reporter Al Adams.

THE COVER

Scene: Chevrolet's transmission plant at Parma, Ohio. The season's message is warm and bright . . . Happy Christmas to all.

Ready Now—FACTORY'S 1959 Index to pinpoint your problem-solving ideas. For a copy see Reader Service Card.

F A C T O R Y

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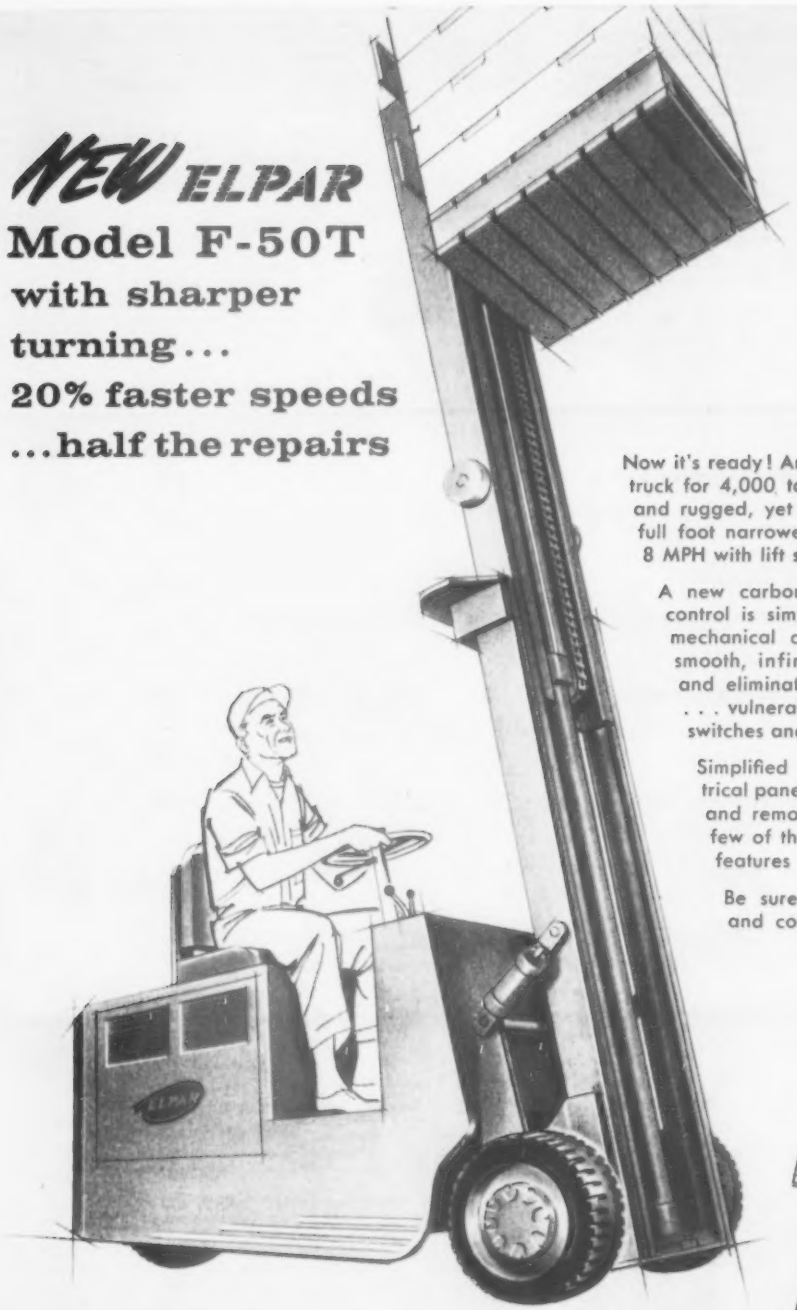
NEW ELPAR Model F-50T with sharper turning... 20% faster speeds ...half the repairs



MODEL F-50T-
4,000 TO 6,000 LB. CAPACITY

Now it's ready! An all new ELPAR electric fork truck for 4,000 to 6,000 lb. loads. It's tough and rugged, yet it will stack from an aisle a full foot narrower than before. Top speed is 8 MPH with lift speeds to 60 FPM.

A new carbon pile Acro-Smooth speed control is simplicity itself. Using a simple mechanical control linkage, it provides smooth, infinitely variable travel speeds and eliminates major maintenance items . . . vulnerable speed contactors, master switches and resistance boxes.

Simplified hydraulics; removable electrical panel; center-sill unit construction; and removable dash board are just a few of the many "easy maintenance" features on the new F-50T.

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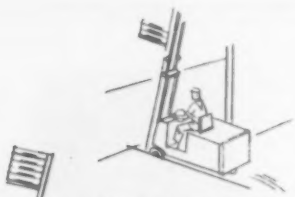

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For more facts Circle 449 on Reader Service Card

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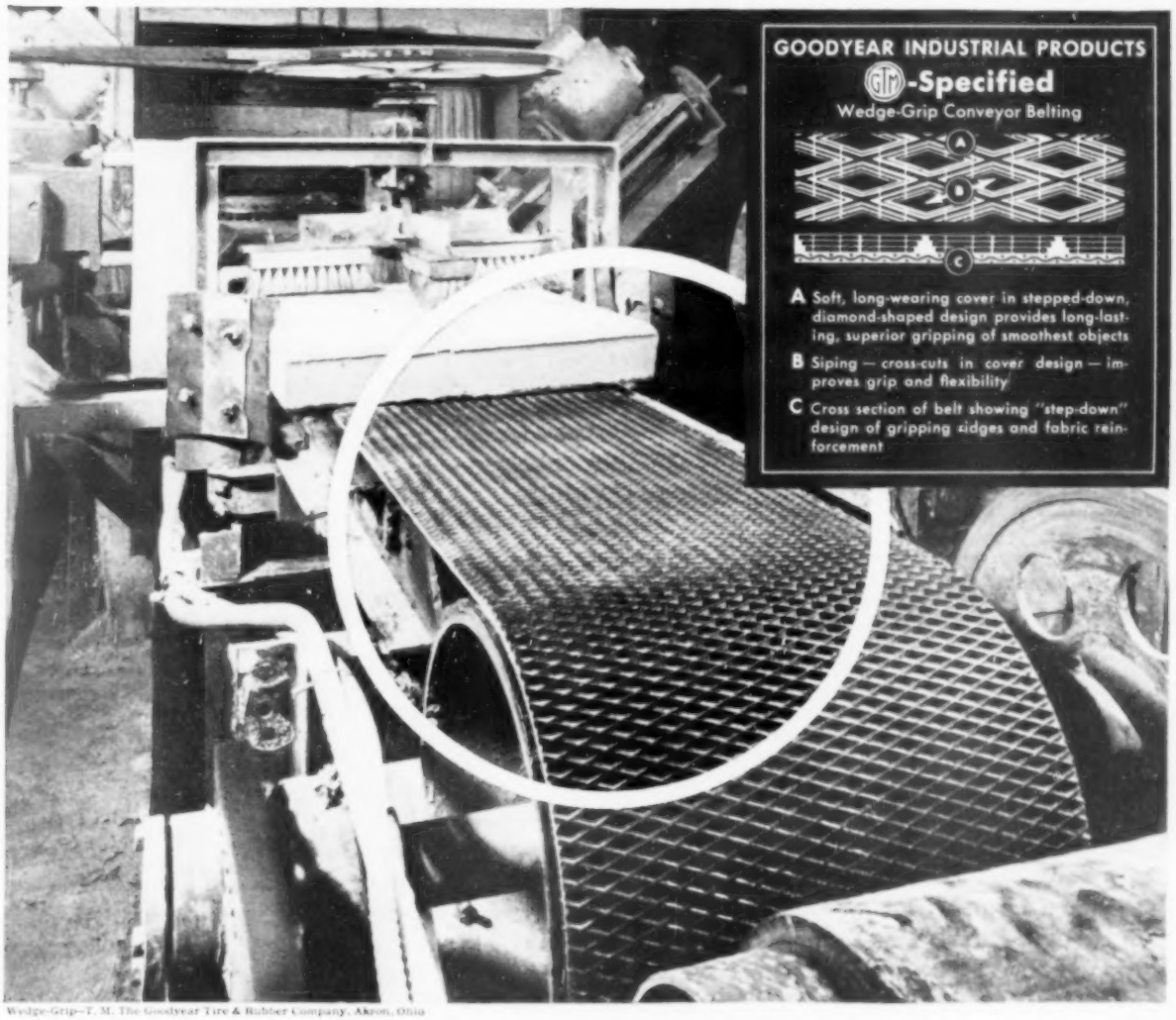
$10 to $30 a day no longer slips away

The sizing machine was a profit-eater at this big Southeastern tilemaker's. For no matter what type feeder belt they tried, the oil-slick tiles would slip and slide. That meant some tiles stayed under the sizing wheel too long – sending $10 to $30 worth to the scrap heap every day.

Then their Goodyear Distributor learned of the problem. He consulted with the G.T.M. – Goodyear Technical Man – then recommended a special oil-resistant version of the famed Wedge-Grip belting.

And the result? The soft, flexible Wedge-Grip cover– in its unique, stepped-down, cross-cut design – keeps a firm grip on those slippery tiles at all times. That virtually ended the rejects. *So the Wedge-Grip paid for itself in the first month of use* – and its deep-etched design won't wear smooth for years.

That's typical of the problem-solving suggestions you get–together with the top-quality industrial rubber products to make them pay off–when you check with your Goodyear Distributor and the G.T.M. You'll find his name under "Rubber Products" or "Rubber Goods" in the Yellow Pages of your phone book. Or write Goodyear, Industrial Products Division, Akron 16, Ohio.


GOODYEAR INDUSTRIAL PRODUCTS
GTM-Specified
Wedge-Grip Conveyor Belting
A
B
C
A Soft, long-wearing cover in stepped-down, diamond-shaped design provides long-lasting, superior gripping of smoothest objects
B Siping — cross-cuts in cover design — improves grip and flexibility
C Cross section of belt showing "step-down" design of gripping ridges and fabric reinforcement

Wedge-Grip–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR

THE GREATEST NAME IN RUBBER

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REPUBLIC MATERIALS HANDLING EQUIPMENT... saves time at Signode Steel Strapping

680 Republic Stacking Boxes in use and more on order!

The Signode Steel Strapping Company, Glenview, Illinois, makes good use of these rugged boxes in the production of stretchers, sealers, cutters, power strapping machines, and seals. Signode, largest producer of such equipment in the U.S., knows that Republic Stacking Boxes speed materials handling while greatly reducing storage area requirements.

At Signode, boxes are filled with finished parts and stacked high awaiting production assembly or shipment. Stacking does not damage the boxes. Heavy-duty stacking brackets and corrugated box construction deliver long, efficient service at low per-year cost. In addition, four-way fork channels simplify handling in restricted space. Smooth flange around the top eliminates sharp edges.

Let the materials handling engineers of Republic's Berger Division work with you in solving your materials handling problems. Like Signode Steel Strapping, you'll find there are many new ways to save time, money, and storage space in your plant. Call your Republic representative or write direct.

For more facts Circle Reader Service Card Numbers as follows:

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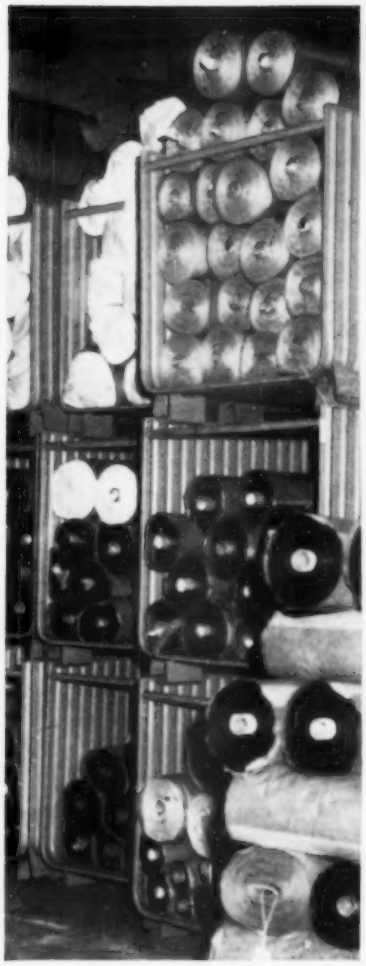

MATERIALS HANDLING EQUIPMENT FOR THE TEXTILE INDUSTRY reduces the problem of handling, transporting, and storing bolts of cloth. Open-end construction permits easy access to bolts. Offset channels under each unit permit tiering to any practical height, save space. Rugged, corrugated construction assures long, efficient life at lowest per-year cost. And, four-way fork channels simplify handling. Mail coupon for additional information.

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451 Materials Handling Equipment, 452 Metal Lumber, 453 Steel Lockers

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There's a HAND or HYDRAULIC powered PORTER CUTTER to answer your toughest metal-cutting problems — over 100 different cutters, all designed to save you time, labor, and money! Make short work of cutting:

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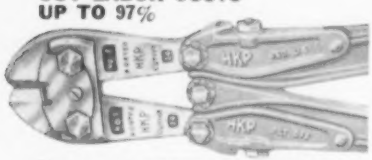

The famous PORTER CENTER-CUT CUTTER . . . our most popular tool . . . is the leading all-around cutter for industrial use! For Free Cutting of Soft and Medium Hard Metals up to ¾". Available in 6 sizes.

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The PORTER WORK-STATION CUTTER can increase one man's output up to 300% in continuous volume cutting! In 3 sizes — up to ½" capacity!

ALSO . . . for those RUGGED JOBS!

The PORTER HEAVY DUTY CUTTER cuts almost anything in metal up to ¾" diameter — thanks to its heat-treated, hard-tempered center-cut jaws! Comes in 3 sizes.

Contact your Industrial Distributor . . . or write for your free catalog with illustrated, detailed descriptions of the versatile PORTER line!

CUT up to ¾" rods with **HAND OPERATED TOOLS** — up to 1⅜" rods and 2½" power cable with **POWER OPERATED TOOLS.**

H. K. PORTER, inc.
Somerville 43, Mass.

FACTORY . . . LETTERS

WELCOME BOUQUET

Sir:

Recently I had forwarded to me a copy of an excellent article printed in the September 1959 issue of FACTORY (page 109). The article is "How to Organize for Better Maintenance." This is one of the few works on this subject I actually feel presents an honest, straightforward approach that strikes home to those reading it. This is reading that greatly enhances the value of your magazine.

Arthur J. Bossert
Plant Engineer
Cornell Aeronautical Laboratory
Buffalo 21

► FACTORY's editors are happiest when we receive comments like yours. Apparently Tom Mostyn and Carl Wyder hit the nail on the head.—ED.

AHOLT CATCHES ON

Sir:

I rise in rebuttal to any man who calls attention to any alleged misspelling of the word "hold" in the "Knock the W off wrench" Idea of the Month on page 184 of September FACTORY.

Any boll weevil who thinks your dull teeth slipped never hit the hooks and probably doesn't know the difference between a stabber and a collar pecker. All Texas and Oklahoma pipeliners of the old screw pipe school will agree with you. A pipe wrench, chain tongs and pipe hooks "grab aholt." Your only mistake is that "aholt" is one word, not two.

J. F. Thornton
General Maintenance Supt.
Phillips Petroleum Co.
Bartlesville, Okla.

► My hat's off to any man who knows my "dull teeth" did *not* slip when I wrote "holt" for "hold." And it's no small comfort to learn that at least one FACTORY reader stands ready to rise to my defense.

I hope you're right about "aholt." I was coward enough to avoid it and write "takes a holt" because my ancient (1922) Webster's gives "holt" as a variant of "hold," but says nothing about "aholt." I now (after 32 years with FACTORY in New York) operate from a little town in the Green Mountain State, far from the madding crowd, as well as from a public library and a modern dictionary. For all I know, "aholt" may have taken holt with the Merriam folks long ago. If it hasn't, let's get together right now and decree it into existence as a legitimate word—what other good way is there for a self-respecting pipe wrench to grab?—ED.

IDEA WITH MERIT

Sir:

I was particularly interested in your article, "Newest Trend for Job Shops Is Point-of-Use Storage," in the February issue of FACTORY (page 144). I believe some of the ideas would lend themselves to a batch process such as paint manufacturing. Have you any further information on the use of this concept in the paint or allied industry?

Lawrence Shatkin
Production Manager
Adelphi Paint & Color Works, Inc.
Ozone Park 17, N. Y.

► We have no doubt that you can apply the principle of point-of-use storage in your plant. However, none of the cases we found for this article involved manufacturing paint. We suggest you study the flow of your processes, including the handling of materials, containers, and products. This should help you to see where you might move the storage of some of these materials to reduce material handling and simplify inventory.—ED.

ERRORS CORRECTED

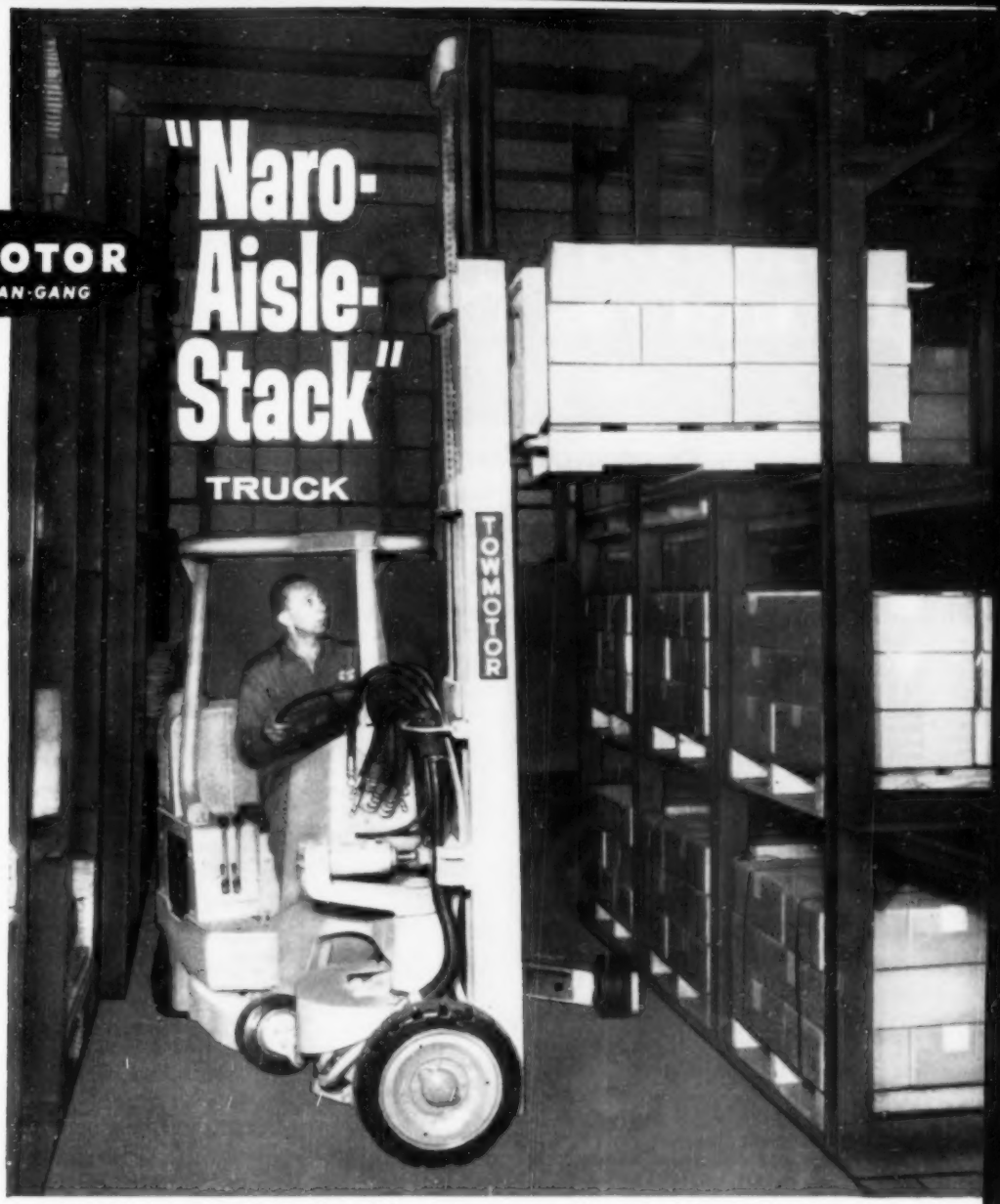
Sir:

My compliments for the fine presentation of my article "Dynamic Evaluation" in September FACTORY (page 98). Arrangement and art work were excellent. But some mischievous gremlins must have worked on the final stages since three errors not in the copy appeared in the book.

1. On page 100 under "Curve

TOWMOTOR
THE ONE-MAN-GANG

"Naro-Aisle-Stack" TRUCK



Stacks either side in 6-foot aisles...

Increases storage capacity up to 35% . . . gives you an "extra warehouse" free

Newest idea in fork lift trucks!

also performs like standard lift trucks

The "Naro-Aisle-Stack" series is a Towmotor "first" that offers an entirely new mass handling technique in fork lift truck operation.

Equipped with hydraulically operated outriggers, Towmotor "Naro-Aisle-Stack" trucks perform right and left angle stacking in aisles 6 feet wide, or from four to six feet narrower than lift trucks usually require.

In addition, they also perform all of the functions of a regular fork lift truck. They pick up and lift heavy loads at speeds of 70 feet per minute. Their built-in maneuverability and pivot-action make it possible to operate in congested storage areas and turn sharp corners with the agility, safety and comfort only a sit-down type truck offers.

The new Towmotor "Naro-Aisle-Stack" truck is made possible only by the use of the exclusive Towmotor Towmostatic Drive—the drive that eliminates the clutch, the transmission, the drive line, the differential and all shifting mechanism. It's a brand new idea in fast, efficient materials handling.

For complete information, write Towmotor Corporation, Cleveland 10, Ohio, and ask for folder No. F-37.

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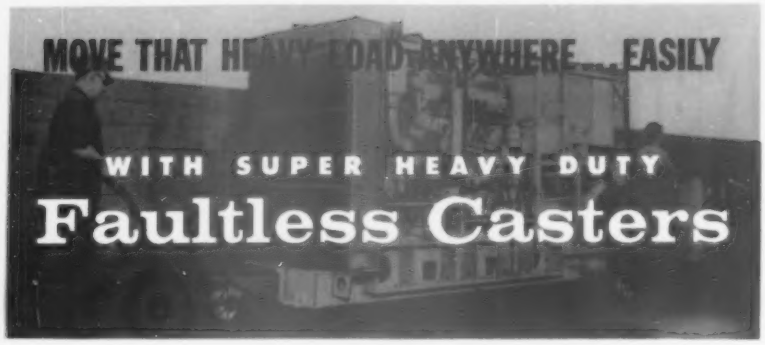


Dreadnaught Casters move loads up to

SERIES 1300
¾" thick swivel top plate. Dust-proof self-contained swivel load bearing. Hardened ground and polished raceways. Timken combined radial and thrust bearing. Thick steel horn with reinforced ribs. Special alloy wheel with two Timken bearings.

7½ Tons
PER CASTER

When it comes to *CASTER STRENGTH* for rolling the big loads along your assembly line, or around your stock pile area, Faultless engineered casters can give a lift to your big production and warehousing problems. Above, a Faultless Series 1300 Swivel Plate Caster and two Faultless wheels in special mountings easily handle a 22,000 lb. Caterpillar Diesel-electric engine with minimum manpower; a usual task for the Faultless Series 1300 Dreadnaught Caster.

Super strong HX300 Casters handle loads up to

5 Tons
PER CASTER WITH 8" WHEEL

For surplus strength to roll under cargoes that break down or damage ordinary casters, the HX300 Series, extra heavy duty swivel caster, will fit your specifications. It's precisely engineered throughout and constructed of quality materials to provide a caster capable of easily taking on 10,000 lb. loads, while keeping production lines moving with minimum handling costs.

SERIES HX-300
1" dia. king pin. Thick steel top plate. Self-contained main load bearing has dust guard and grease seal. Timken radial and thrust bearing. 8" or 10" semi-steel wheels with Timken bearings.

INDUSTRIAL DISTRIBUTORS — SERVING INDUSTRY ECONOMICALLY — THE RIGHT HAND OF PRODUCTION

ASK YOUR DISTRIBUTOR: Your nearby Faultless Industrial Distributor maintains a substantial inventory of Faultless Casters for immediate delivery. He and one of the strategically located Faultless Sales Engineers are available to work with you on every handling problem in your plant. Both are listed in the phone book Yellow Pages, under "Casters," and the Faultless heading.

Faultless Caster Corporation
Evansville 7, Indiana

Representatives in Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Dallas, Detroit, Grand Rapids, Greenville, S.C., High Point, Indianapolis, Los Angeles, New Orleans, New York, Philadelphia, Portland, St. Louis, Washington, D.C., Canada: Stratford, Ontario.

NOELTING Faultless Casters

3—Effective unit." This curve is *not* obtained by plotting the quotients of numbers in Column B divided by corresponding numbers in Column D. Nor does it show average labor hours for a small group of units. The effective unit curve shows the effective cost of *each* unit indicated on the horizontal scale. The curve is obtained either mathematically or by successive subtractions of the cumulative curve's values for each unit.

2. In Problem 4 on page 103, $8\% \times 2.5$ equals 0.2, not 0.4.

3. In same problem, last sentence in third from last paragraph should read: "Percentage *decrease* in cumulative *average* labor dollars *per unit* thus becomes $3.01 - 2.19 - 3.01 \times 100 = 27.2\%$."

Francis T. Koen
Missile Systems Division
Raytheon Co., Andover, Mass.

► Our apologies for these errors. They're ours and we take full responsibility for them.—ED.

ONE MISSED

Sir:

I was extremely interested in the article in the October issue of FACTORY on malfunction detectors (page 96), but disappointed that ADT Industrial Process Supervisory Service was not included. Maybe next time your editors get on this subject we could be included.

J. J. Caffrey
Manager, Sales Promotion
American District Telegraph Co.
New York 13

► In a round-up like this we *try* to cover all the bases but occasionally we miss one.—ED.

ALCOHOLIC AID

Sir:

We have read with interest Arthur H. Cain's article, "The Alcoholic: Who He Is, How You Can Help Him," in the June issue of FACTORY (page 244). Even in view of your September correction, $875,000 is still a most substantial sum for one company to lose, unnecessarily, in any given year to

It's a Snap

The Fenwal 541 Temperature Indicator Controller

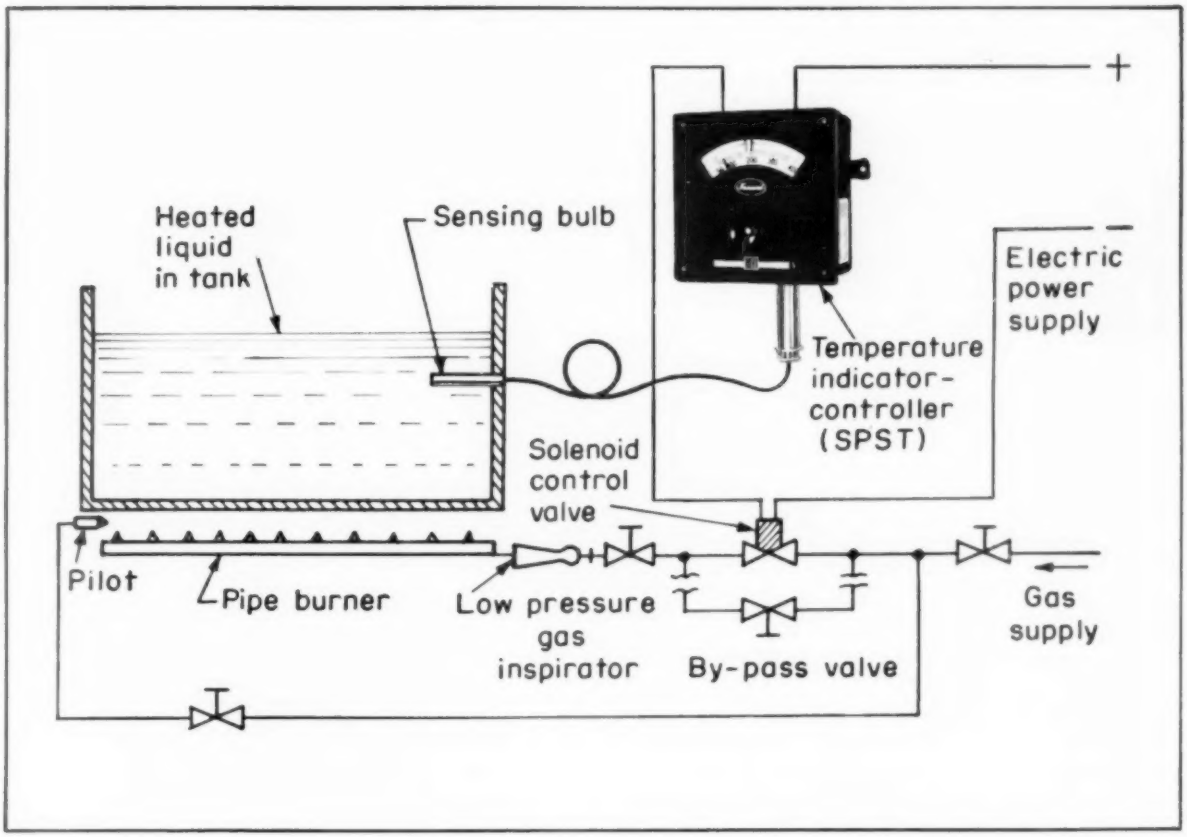
is simple to install, operate, and maintain!

There's no easier way to be sure of precise, economical heat control in simple process systems than with a Fenwal 541 Temperature Indicator Controller. Installs in minutes . . . sets with a turn of the control knob . . . control switches can be replaced without even disturbing internal mechanism. *You can't go wrong!*

Installation on atmospheric gas burner (below) is typical. The 541 is available with a wide choice of bulb styles and hundreds of combinations to meet widely varying process requirements. Welded steel case protects against splashing and dust. All moving parts operate in opposition . . . compensate for wear and keep accuracy high. *You don't have to baby this controller!*

Available in 5 different temperature ranges within the span of −150° to +700°F, the 541 can control as many as four circuits simultaneously! Current ratings: 15 and 20A-125-250VAC; .50A-125VDC; .25A-250VAC. For full details see your Fenwal Distributor. For application data sheets, write Fenwal Incorporated, 2513 Pleasant Street, Ashland, Massachusetts.

The Fenwal 541 Temperature Indicator Controller provides economical, highly accurate control of heat in this atmospheric gas burner system. Rugged liquid filled sensing bulb and capillary tube activate control of gas supply.



ANOTHER EXAMPLE OF HOW **Fenwal** CONTROLS TEMPERATURE . . . PRECISELY

For more facts Circle 457 on Reader Service Card

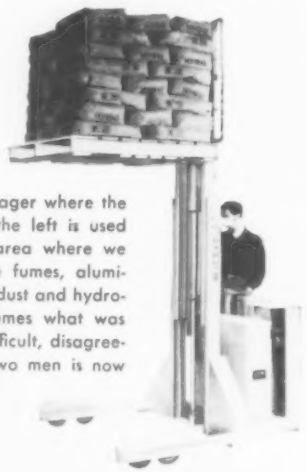
EXPLOSION PROOF
CLASS I GROUP D
POWERED LIFT TRUCKS

Underwriters' Laboratories, Inc. INSPECTED TYPE EX REVOLVATOR COMPANY

APPROVED and PROVEN

8 YEARS ON THE JOB

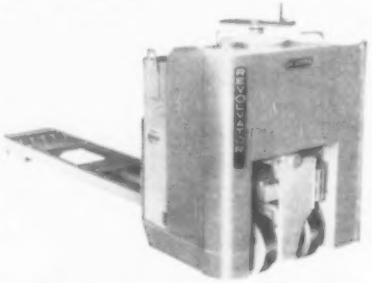
Since 1951 Revolvator Go-Getters, designed for this service, have been specifically approved by leading industrial insurance companies for use in Class I Group D explosion hazardous areas in major plants from coast to coast. User comments like those below show that the Go-Getter has been more than approved by safety authorities . . . it has been proven in use for eight years.



The Plant Manager where the Go-Getter at the left is used says, "In an area where we have explosive fumes, aluminum choloride dust and hydrochloric acid fumes what was previously a difficult, disagreeable job for two men is now easy for one."

Air in the color mixing room of the finishing plant where the Go-Getter above is used carries organic dusts as well as explosive fumes. The foreman says, "The men like the Go-Getter and use it steadily."

Executives in the chemical plant where the model to the right is used say, "We use the Go-Getter in our area which has the most severe hazard." Another plant where quantities of explosive solvents are used for "wash down" reports of a similar model, "We are well pleased and we are ordering another Go-Getter."



A major insurance association writes, "We are quite willing to accept the unit (Go-Getter) as it is designed with explosion proof housings for the motors and controls as usually specified for electrical equipment that can be safely used in explosion hazardous areas."

A nationally known safety engineer writes, " . . . calling the existence of this line of trucks to the attention of the industry as we believe many would want to know about this equipment."

The Go-Getter is the latest addition to a complete line of materials handling equipment for use in explosion hazardous areas that Revolvator has been building for over a quarter of a century.

REVOLVATOR CO.
8761 TONNELE AVENUE, NORTH BERGEN, N. J.
SINCE 1904

industrial alcoholism. As Mr. Cain said, the annual cost to industry as a whole is now over $1-billion.

We reprinted and distributed this fine piece to our fifty-odd affiliated committees on alcoholism throughout the country. We congratulate you on publishing this article.

(Mrs.) Marty Mann
Executive Director
National Council on Alcoholism
New York 29

► We're glad this article was helpful to you.—ED.

NON-EXISTENT PRODUCTION

Sir:

I attach copy of a form letter we are using for queries resulting from an item you carried on page 130 in your August issue ("Seals Out Cold"). I cannot hazard a guess as to how the "epoxy resin" reference crept into this item. The material used in building the weather seals in our plant was sponge rubber obtained from the B. F. Goodrich Co. These were 1x12-in. strips built up to 8-in. thickness. The Goodrich sponge rubber was the only flexible foam suitable for this use then on the market.

E. N. Brandt
Manager of Public Relations
The Dow Chemical Co.
Midland, Mich.

► Unfortunately, we can never completely undo a mistake like this. However, we can at least admit that we are human and do make errors. Thanks for correcting us.—ED.

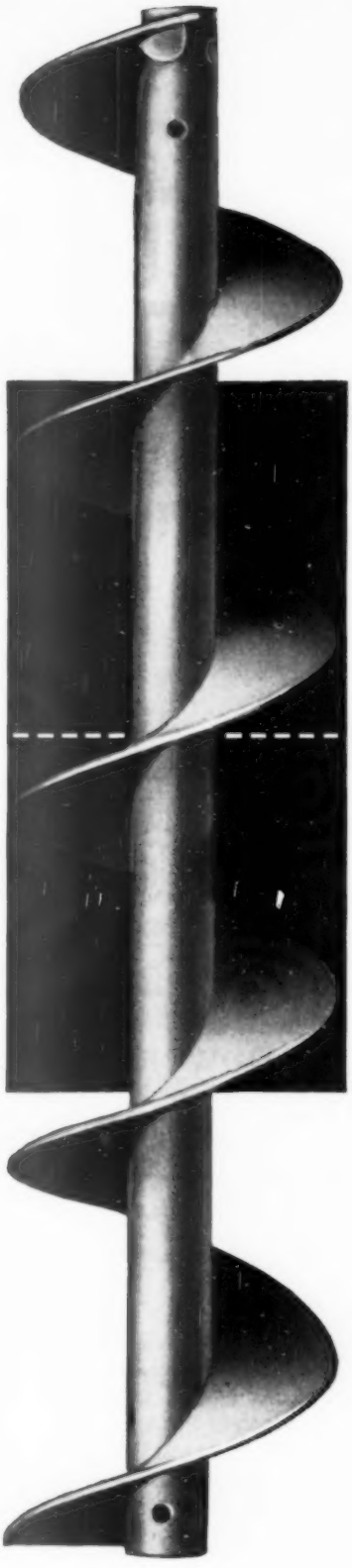
INFORMATION WANTED

Sir:

The September 1959 edition of FACTORY's Case Book Section refers to "Sonic whistle opens doors" on page 167. Please furnish us with the manufacturer's name and address for this item.

C. J. Chausse
Phoenix Metal Cap Co., Inc.
Chicago 8

► Whistle is called "Autosonic." It's made by Vendo Co., 7400 E. 12th St., Kansas City, Mo.—ED.



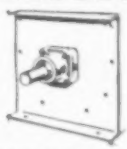
LINK-BELT is

YOUR ONE SOURCE FOR ALL SCREW CONVEYOR NEEDS

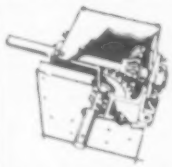
your only source for many

QUIK-LINK CONVEYOR SCREW. For ease in removal of conveyor section without disturbing other components. Can be furnished on Helicoid and Sectional flight conveyors.

HANGERS have wide top bar with slotted bolt holes for easy assembly and alignment. Available with self-aligning ball bearing or with sleeve bearing in babbitt, hard iron, bronze or oil impregnated wood.



TROUGH ENDS of heavy steel plate are flanged at top and bottom. Furnished with babbitted, bronze or single or double ball bearing flange block, with or without trough end seal. Blocks are interchangeable.

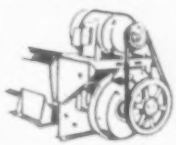


COUNTERSHAFT ENDS with ball and roller bearings or babbitted bearings, for right angle drive applications— common drive for two conveyors at right angles.

TROUGHS are accurately formed and jig-assembled. Steel angles securely welded to trough plate form top flanges. Can be made of stainless steel or other special metals to suit specific requirements.

SEMI-FLANGED, SPRING CLAMP COVERS are more rigid, easier to handle and form a tighter seal than plain type cover. Spring clamps are attached to cover—simplifies installation.

DISCHARGE SPOUTS AND GATES can be located anywhere along length of conveyor trough. Gates can be flat or curved —hand or rack-and-pinion operated.



DRIVES. Link-Belt shaft-mounted speed reducers are simple, compact — can be mounted directly on trough end plate. Motogears and Gearmotors with roller chain drives can also be furnished.

With seventeen basic screw designs, and a full line of components, Link-Belt can furnish anything you need from a single component to a complete line of screw conveyor.

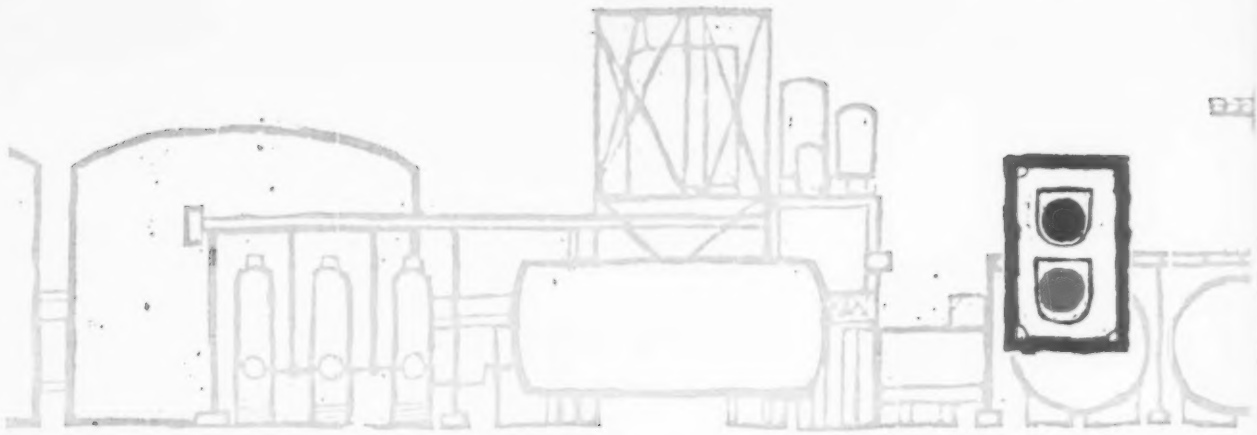
As the foremost producer in this field, Link-Belt offers a range of new product improvements for profitable operation. Quik-Link conveyor screws, hangers, trough ends with ball or sleeve bearings, jig-welded troughs with new semi-flanged spring clamp covers—these and many more are cutting power demands and maintenance costs.

If you have bulk materials to be handled, it will pay you to look into the Link-Belt screw conveyor line. All components are available from stock. Call or write your nearest Link-Belt office or authorized stock-carrying distributor for Book 2989.

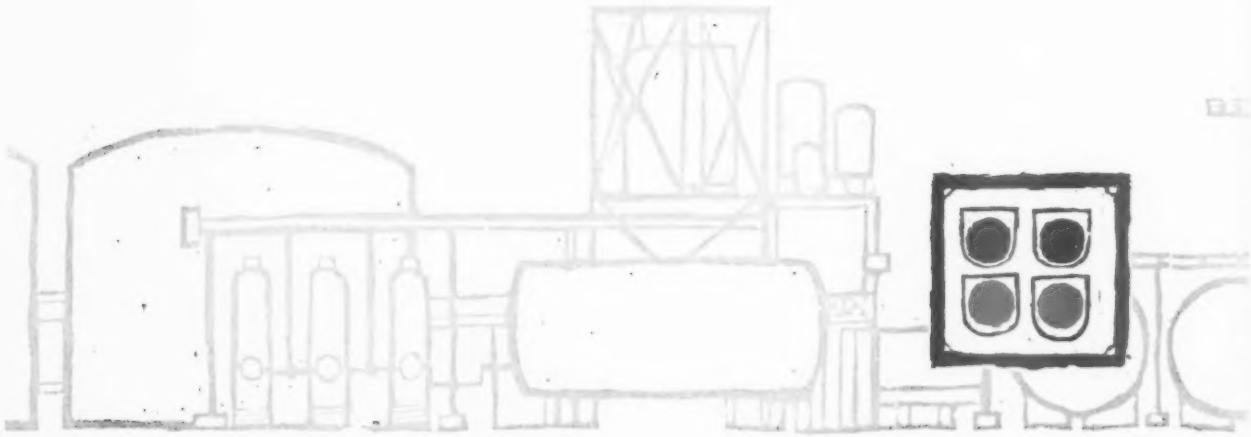
LINK-BELT

SCREW CONVEYOR

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,238

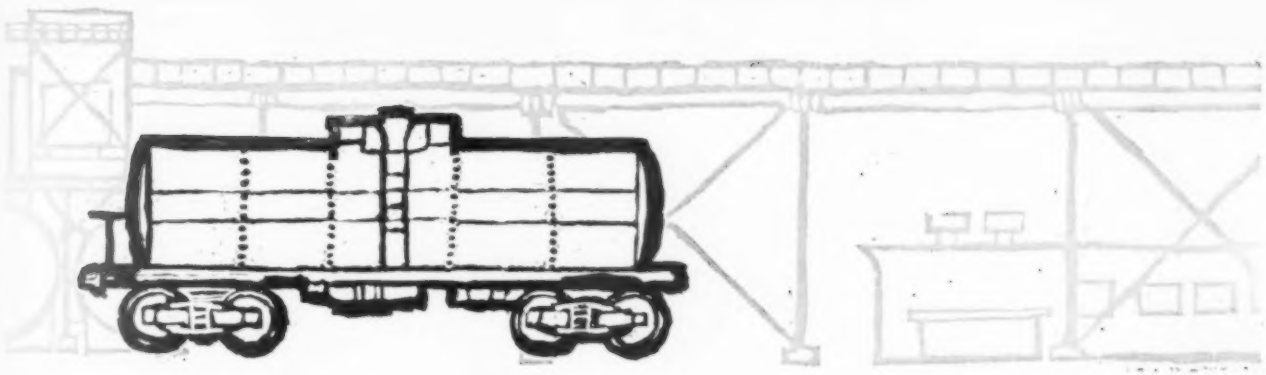


In 1956, with this plant, Olin Mathieson

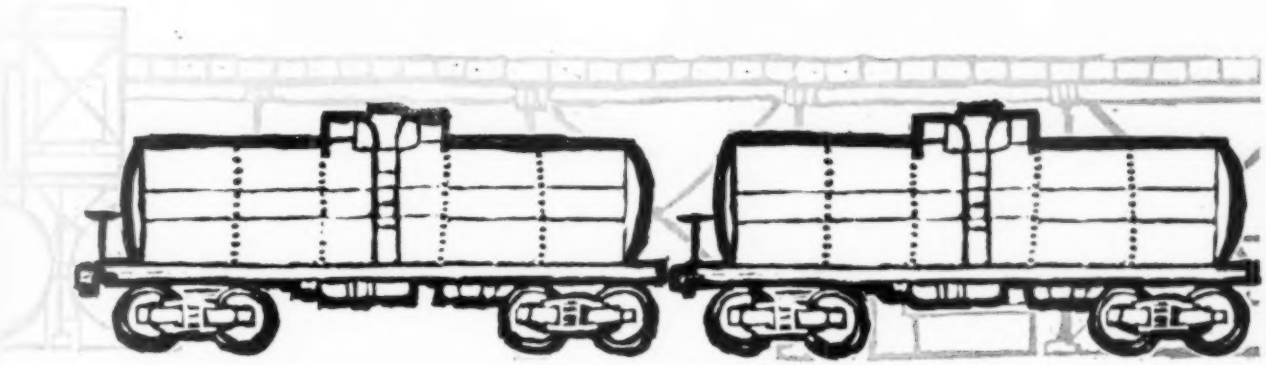


Now, by doubling use of electric power, they

POWER-UP FOR PROFIT



produced this much caustic soda and chlorine



produce twice as much with reduced overhead costs

ELECTRICALLY

. . . POWER-UP is a Westinghouse program to help you increase profits through greater productivity. In your plant, it may be a materials handling system, higher capacity machinery, or a more productive environment through higher lighting levels and air conditioning. One thing is certain—whether or not you earn satisfactory profits in the '60s will depend on your making maximum use of low-cost kilowatthours.

A production increase of 40% is forecast for 1965. Be sure—like Olin Mathieson—that your electrical equipment is engineered to produce profits as well as output. Call your Westinghouse representative. He can tell you the electrical steps you can take *now* to start a Power-Up program in your plant. J-96113

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

There goes another consignment of red ink

The salesman spent a week in Bermuda on his commission. The front office rejoiced. But the company lost money.

What was wrong? Factory overhead.

This company has a plant-wide burden rate. All costs are based on it. In some departments, actual overhead is *less* than the standard rate. Profits are high. In others—notably those which turned out these assemblies—actual overhead *exceeds* the standard rate. Prices don't cover it. Profits are seldom—if ever.

How different with Automatic Keysort Data Processing! With Automatic Keysort, the Plant Manager can pinpoint burden charges by *department* . . . and prices may be set to allow for profit in each operation. Because plant operating figures are reported *on time*, unrealistic overhead rates can be quickly spotted.

Automatic Keysort's easy-to-use machines and punched cards require no specialized personnel, no restrictive procedures. Designed to fit your business as it stands and as it grows, Automatic Keysort will give you all the fast, accurate information you need for modern management control of every factory operation. And at remarkably low cost.

To learn more about how Automatic Keysort Data Processing can fulfill *your* need for timely, comprehensive facts and figures, call your nearby Royal McBee Data Processing Representative, or write Royal McBee Corporation, Data Processing Division, Port Chester, New York for brochure FS-43.

ROYAL McBEE · *data processing division*

NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

For more facts Circle 461 on Reader Service Card

For more facts Circle 462 on Reader Service Card ➤

Pittsburgh COLOR DYNAMICS® used in Chrysler Corporation's huge new stamping plant

Modern system of painting helps to improve productive efficiency, morale and safety of workers in world's largest factory building located at Twinsburg, Ohio.

As **another important step** in the continuing expansion of its production facilities, Chrysler Corporation has activated its mammoth new stamping plant at Twinsburg, Ohio.

● **Walls, ceilings, floors,** machines, conveyors, motorized equipment and overhead cranes throughout this immense structure are painted according to Pittsburgh's modern system of COLOR DYNAMICS.

● **This huge building,** covering 1,835,900 square feet of space, is the world's largest plant under one roof. Here are produced roof and rear quarter panels, fenders, door panels, deck lids and other smaller body parts for all Chrysler Corporation cars and trucks. Production capacity is 2,000 tons of steel per day.

● **One of the impressive features** of this new plant is the greater use of modern machinery. As this equipment reduces physical fatigue by increasing efficiency in the handling of materials, so the functional use of color, according to COLOR DYNAMICS' principles, lessens eye fatigue and nervous tension among workers.

● **Proper use of eye-rest** and focal colors provides better contrast between working parts and materials being fabricated. Operators see their jobs better and with less eye strain. Morale-building colors on walls and ceiling reduce glare from light sources and eliminate heavy shadows, creating more pleasing work areas. Warning and safety colors on machine controls, conveyors, motorized equipment, traffic lanes and cranes indicate hazard areas and reduce the danger of time-loss accidents.

● **Chrysler's new Ohio stamping plant** is only one of thousands of factories in which COLOR DYNAMICS has helped to improve productive efficiency, morale and safety. Why not test the practical value of this modern painting system in your plant? You'll find it costs no more than conventional maintenance painting.

You can get a COLOR DYNAMICS Plan of Your Factory—FREE!

● For a complete explanation of COLOR DYNAMICS, send for our new profusely illustrated book. It explains simply and clearly what this new kind of painting system is and how to put it to work in your plant on machines, walls, floors, ceilings and mobile equipment. Better still, we'll gladly show you exactly how to apply it in your plant. Let us submit a detailed color study of your entire factory, or any part of it, without cost or obligation. Call your nearest Pittsburgh Plate Glass Company, or mail this coupon.

Watch the Garry Moore Show—CBS-TV—Tuesday evenings.

Send for a Copy of this FREE Book

Pittsburgh Plate Glass Co., Paint Div.,
Department F-128, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your booklet "COLOR DYNAMICS."

☐ Please have your representative call for a COLOR DYNAMICS survey without obligation on our part.

Name _____

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PITTSBURGH PAINTS

PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

NEW MULTI-ZONE PLATECOIL®

An exclusive* TRANTER advancement in heat transfer technology

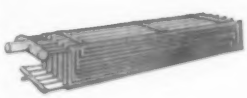
*PATENTS APPLIED FOR

For new savings on more types of tank and process heating than ever before!

Now you can apply the time-proven cost and performance advantages of PLATECOIL over pipe coils to heating and cooling problems involving pressures up to 250 psi. DURAWELD construction, TRANSTEEL mild steel and MULTI-ZONE coil configuration are brand new design and construction features that provide for higher pressure containment and a margin of heat transfer capacity.

MULTI-ZONE coil configuration with multiple headers produces a reserve capacity for faster start-up and better temperature maintenance. High heat transfer efficiency saves tank space. Light weight makes installation easy and economical. Streamlined surfaces are easy to clean. Eliminate the cost of engineering, fabricating and installing pipe coils. Specify the new MULTI-ZONE PLATECOIL.

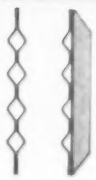
Standard PLATECOIL units



FACTORY-ASSEMBLED PLATECOIL banks.

In factory-fabricated styles to fit your needs

ROLLED to specified diameters



SINGLE EMBOSSED OR DOUBLE EMBOSSED

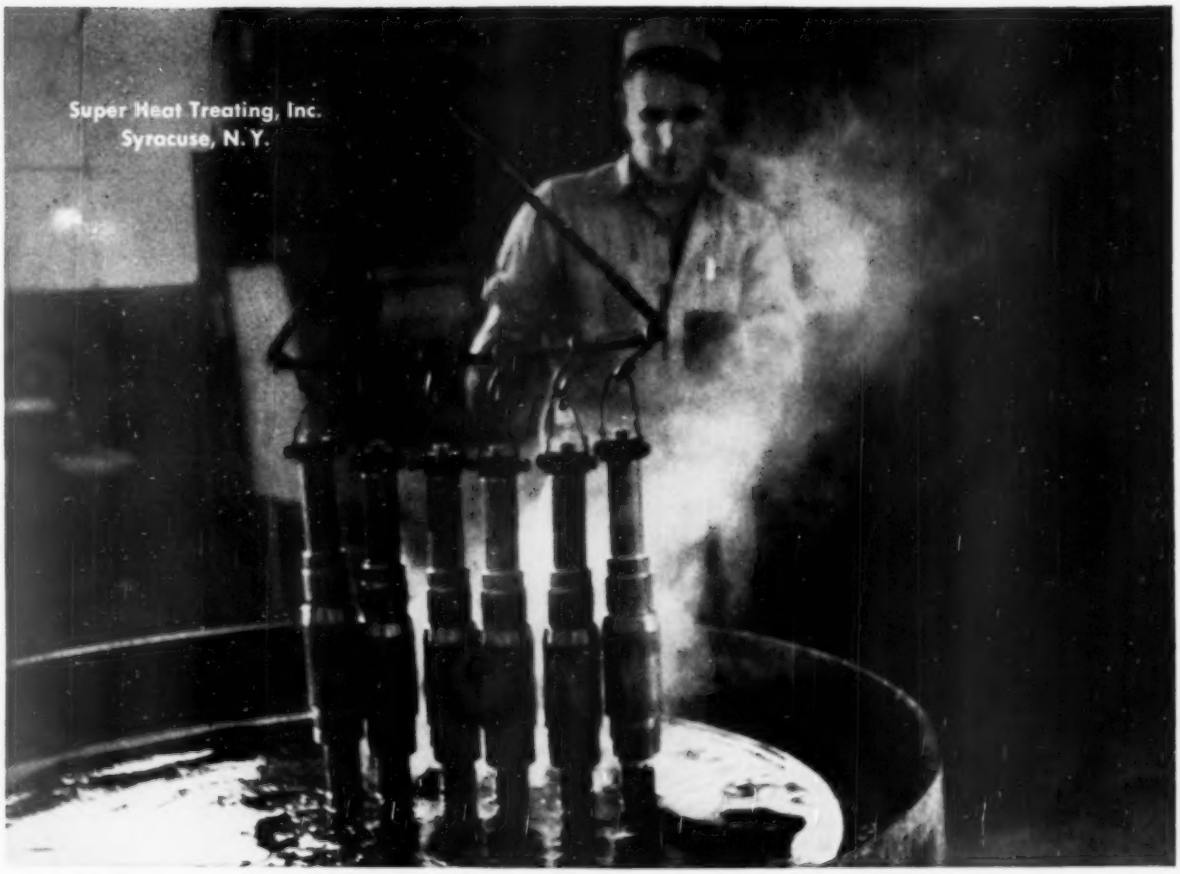
SEND FOR NEW PLATECOIL BULLETIN P60
for complete data and performance characteristics.

Tranter Manufacturing Inc.

LANSING 9, MICHIGAN

PLATECOIL® DIVISION

See LOCAL SOURCES Section This Issue



"No reruns, no breakdowns with Cities Service QT Oils"

Exceptional stability gives real economy says Super Heat Treating, Inc.

At Super Heat Treating, where tolerances run as fine as .004, Cities Service QT Oils have proven their ability to remain stable and deliver these tolerances over periods of 18 months and even longer.

"With Cities Service QT 1 and 3, we handle all sizes of work under the most exacting conditions, without breakdowns or reruns," says President Albert G. Lintel, Jr. "Not only does this performance provide notable economies, but it is a big factor in our ability to offer 24 hour service to our clients. I don't know how an oil could do any more than that."

Again and again, where tolerances are fine and production schedules tight, metalworking firms are turning to Cities Service QT Oils. Some advantages: Better wetting ability, improved cooling power, superior oxidation resistance, high flash and fire point. For a glimpse of what these oils might do for you, talk with a Cities Service Lubrication Engineer from the nearest office. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

"We handle anything from hairpin size to 20,000 pounds and deliver in 24 hours," says President Albert Lintel, Jr. "Naturally we need the best quenching oils—and Cities Service makes them."

Hardness characteristics are always excellent at Super Heat Treating. The firm gives much credit to superior wetting ability, cooling power, and oxidation resistance of Cities Service QT Oils.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

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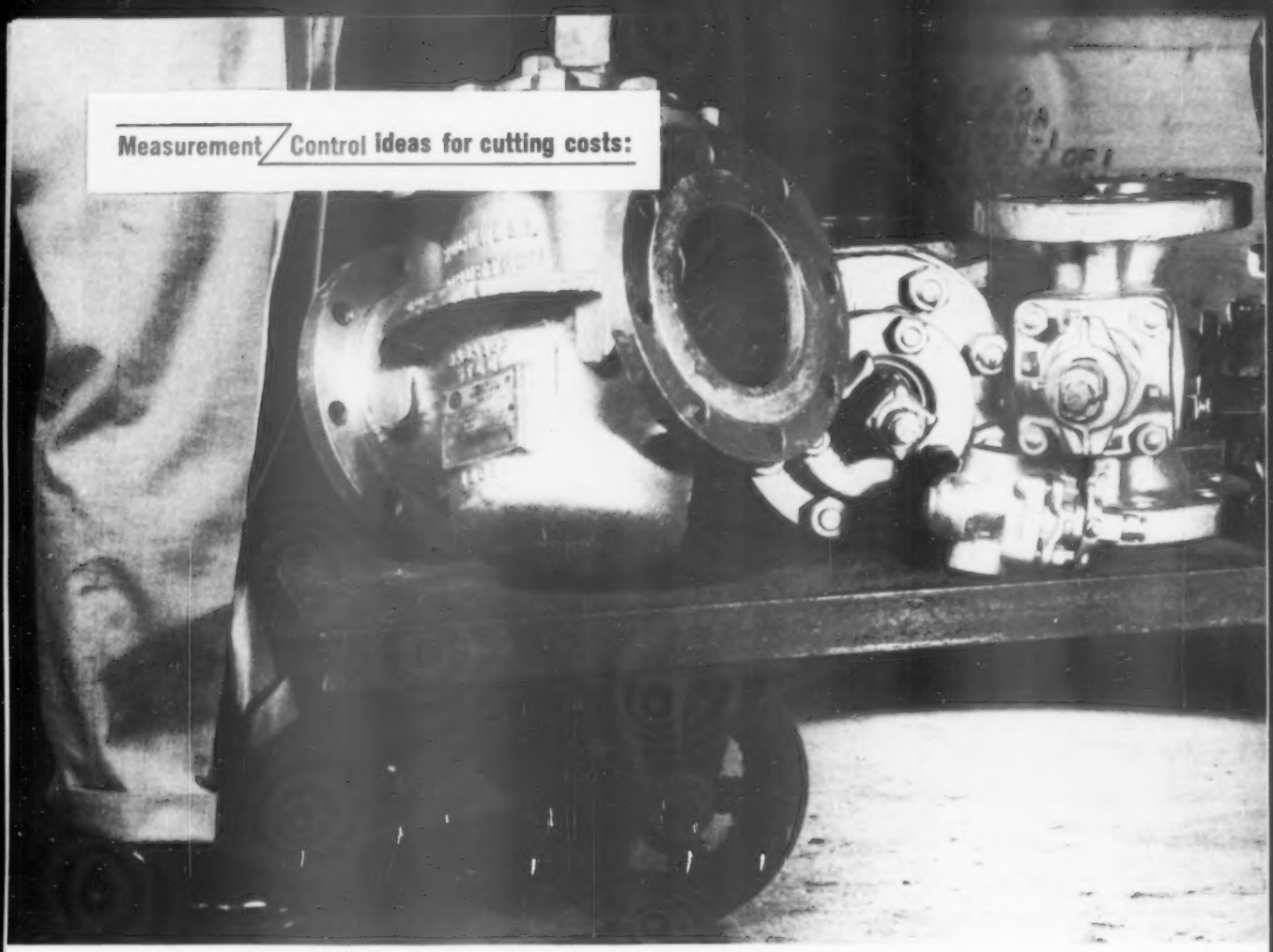
For more facts Circle 464 on Reader Service Card



"If these valves last six months WE'LL SAVE MONEY". . . .

. . . That was the comment of the chief engineer at a plant where pickling acids used to clean steel sheet literally ate the guts out of valves in 4 to 6 months. A Rockwell field engineer recommended a test installation of Rockwell-Nordstrom lubricated plug valves because the fully protected seats and dependability assured by lubrication had proven so effective on even tougher services. *The test valve is still in continuous use after two years.* The test valve led to a full valve replacement program for both the difficult and "easy" services too. It has been an immediately profitable program in terms of direct reduction of down-time and maintenance cost savings over non-lubricated type valves.

This is just one example of the many ways Rockwell field engineers are helping save time, money and material in a wide variety of manufacturing and process plants by suggesting new and better methods of measurement and control. These field men represent Rockwell's experience as the world's largest manufacturer of measurement and control products. Wherever liquids or gases flow through pipe in your plant, this experience can help you cut cost and improve quality. Why not have a Rockwell field engineer visit your plant to explore new approaches to cost cutting through improved measurement and control. Send the coupon today—there's absolutely no obligation.

ROCKWELL

The leading single source for Measurement / Control products and ideas

For more facts Circle 465 on Reader Service Card

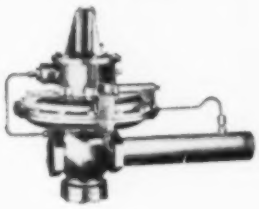
"IN-PLANT" METERING:

LIQUIDS AND GASES

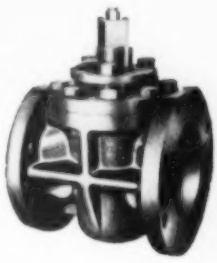
Rockwell gas and liquid meters, properly applied, can improve quality control, sharpen cost control, and prevent waste in almost every plant department. A Rockwell Field Engineer can help you find *where* meters will cut costs . . . and Rockwell has a complete line of meters to measure practically anything that will flow through pipe.

CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES



More efficient control of all the material flowing through pipes in your plant is a positive step in cutting costs. There are new applications and new ideas for using gas pressure regulators and valves that will stop wasteful, inefficient, and dangerous handling of fuels, production fluids, and products. A Rockwell Field Engineer can show you *where* and *how*.



HOW MUCH COULD YOU SAVE?

There is hardly a plant of any kind—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. It will cost you nothing to have a Rockwell Field Engineer *show* you. Simply send the coupon below, now.

SEND COUPON NOW!

MEASUREMENT & CONTROL DEVICES

another fine product by

ROCKWELL

Rockwell Manufacturing Company, Pittsburgh 8, Pa. MC1M

☐ Please have a Rockwell Field Engineer call me for an appointment.

Please send literature on ☐ Controlling gas pressures; ☐ Valving gases, liquids and slurries; ☐ Measuring liquids; ☐ Measuring gases.

I am concerned primarily with ☐ Light & Heavy Metal Fabricating ☐ Basic Chemical Production ☐ Chemical Processing ☐ Food, Drugs & Tobacco ☐ General Manufacturing Operations ☐ Petroleum Processing

☐ Others: _____

Name: _____ Title: _____

Company: _____

Address: _____

City: _____ Zone: _____ State: _____

LOOK FOR THESE VALUES TO ADD PROFIT TO YOUR PURCHASES

APPLICATION ENGINEERING—General Electric application engineers are available to assist you with specific application problems, integrating services of other G-E engineering components.

PRODUCT DEVELOPMENT—At General Electric, one of every 13 employees is a scientist or engineer. Product research and development is carried on in 98 laboratories. G.E. currently invests over three times as much, per sales dollar, in research and development as the average for all industry.

NATIONWIDE SERVICE SHOPS—To assure you continued, uninterrupted performance of vital electric components, G.E. maintains one of the nation's most complete and extensive systems of service facilities. Also, General Electric offers you help in setting up a modern Productive Maintenance program, and provides emergency downtime service.

INSTALLATION AND SERVICE ENGINEERING—To facilitate on-time start-up and furnish technical advice for you during installation, and to help train your operating personnel and check operation during initial stages, G.E. maintains an extensive Installation and Service Engineering organization.

ANALYTICAL ENGINEERING—G-E analytical engineers, working with the latest tools of rapid analysis and computation, are available for studies on your special industrial problems. Their efforts constantly result in valuable additions to industry's knowledge of electrical engineering technology.

PROJECT COORDINATION—General Electric's system of project coordination focuses the full capability of management and engineering on your order for product combinations or systems.

PROMPT DELIVERY—Minimizing time between contract and start-up is an important added value of General Electric service. Prompt delivery assures you of obtaining improved product benefits as soon as possible, permitting you to realize production and operating economies with a minimum of delay.

CHARLES B. ADAMS—Manager of General Electric Purchasing Service Discusses Productive Purchasing:

Teamwork Helps Purchasing Identify Added Values

Today's purchasing agent no longer looks only for "the lowest priced product that will meet specifications" but for added product functions, values, and economies which provide greatest *total value*. The phrase "productive purchasing" aptly describes this modern outlook.

Because of its broadened perspective, productive purchasing depends more and more on mutually helpful relationships with other people in other functions. Call this a team approach to determine *total value* if you wish, for that's just what it is.

Someone in your product engineering function, for example, would welcome an opportunity to simplify his own job by helping you to evaluate a supplier's product development or application engineering function. Your marketing or sales management should also be delighted to help you pinpoint added values in a supplier's product which he can pass on to customers.

Teamwork in finding *total value* is at the heart of productive purchasing. It is also at the heart of the enhanced prestige which the purchasing function enjoys in industry today. General Electric Co., Section 666-2, Schenectady 5, New York.

GENERAL ELECTRIC

MARKET SUPPORT—General Electric is vitally interested in the welfare and growth of your business and industry and is active in supporting programs to help stimulate the nation's economy.

QUALITY CONTROL—At General Electric, quality control goes well beyond inspection of incoming materials and statistical testing of finished parts or products. The cost of this vital function is reduced, and the benefits passed on to customers through a new concept, *total* quality control, which influences every operation from receipt of order to shipment.

VALUE ANALYSIS—Almost every product manufactured by General Electric has been value analyzed to enhance final product usefulness and value content while at the same time reducing product costs. Customers benefit by getting the lowest price for products that will reliably supply all the values needed.

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GENERAL ELECTRIC COMPANY
SECTION D666-2
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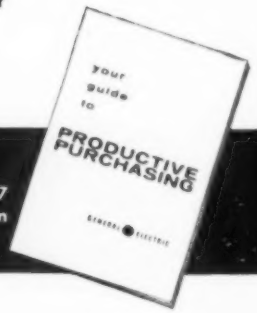

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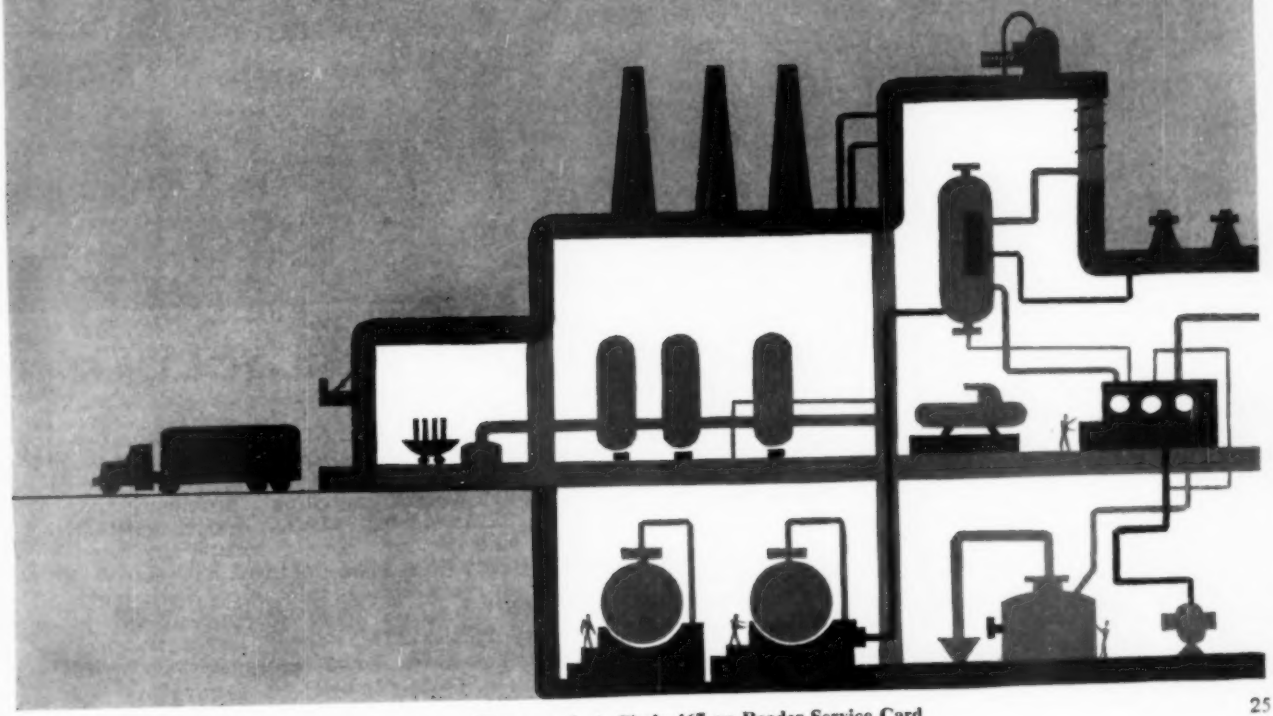

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R/M POLY-V® DRIVE MEETS HEAVIEST LOAD REQUIREMENTS

Poly-V®
Drive Specifications
for 2500 Ton
Erie Forging Press:

Poly-V* Belt "M":
301″ P.L. x 9″ wide,
24 ribs.
Driver Sheave: 17″
P.D. 68″ Diameter
Flywheel.
100 Horsepower.

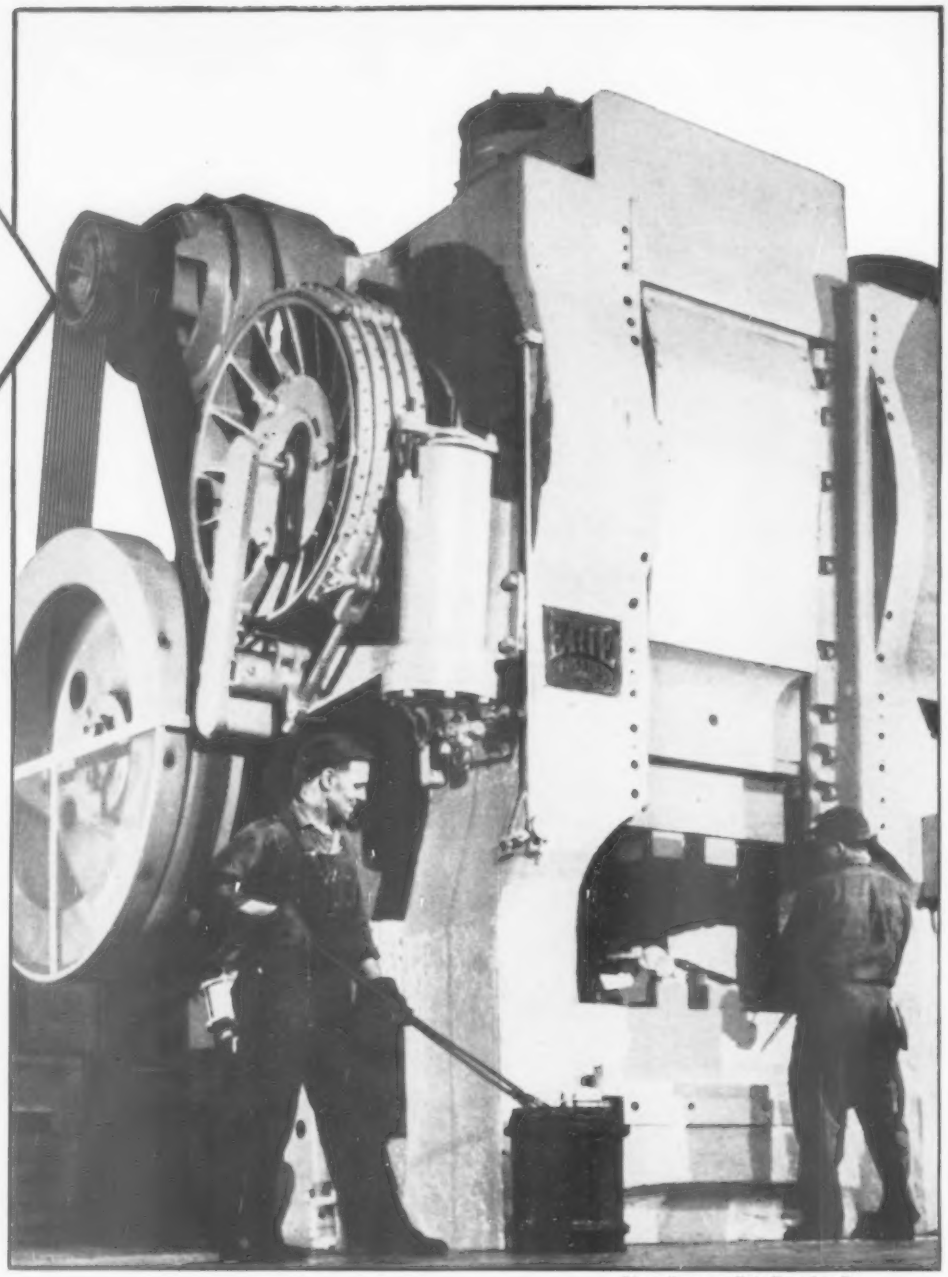


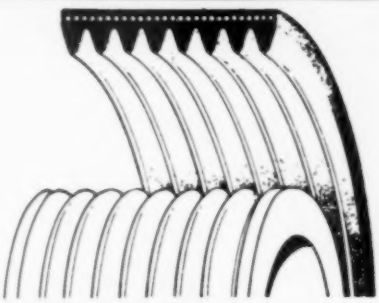
Photo Courtesy Erie Foundry Co.

R/M POLY-V* DRIVE...MORE USE PER DOLLAR

Compact Poly-V Drive delivers power to spare for this huge 2500 ton forging press, newly introduced to industry by Erie Foundry Company. R/M's patented drive design provides the higher horsepower capacity . . . more power per inch of drive width than ever before possible! Because it employs a single, endless V-ribbed belt running on sheaves specially designed to mate precisely with the belt ribs, Poly-V delivers up to 50% more power than ordinary V-drives of equal width . . . or equal power in as little as ⅔ the width. Poly-V Drives have narrower sheaves . . . less shaft overhang . . . less drive weight to meet *every* heavy duty application.

Poly-V's single unit belt design eliminates multiple-belt "length matching" problems, too. Belt speed ratio and belt position remain constant from no load to full load . . . assure smoother, cooler running—less wear on belts *and* sheaves! Just two belt cross sections meet every heavy duty drive requirement. Ask an R/M representative to help determine the R/M Poly-V* Drive specifications for your power driven equipment. Or write for Bulletin #M141.

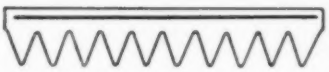
For more facts Circle Reader Service Card numbers as follows:



- **ELIMINATES "MATCHING" PROBLEMS**

A SINGLE UNIT across full width of sheave—NOT an assembly of SEVERAL V-BELTS

Poly-V



V-Belts

- **MORE UNIFORM POWER**
- **IN LESS SPACE**

Uninterrupted strength member full width of sheave provides higher horsepower capacity with less stretch —in less space.

- **MAINTAINS GROOVE SHAPE**
- **COMPLETE CONTACT-PRESSURE**
- **MORE CONSTANT SPEED RATIO**

Sheave grooves do not wear out of shape. Full and complete contact-pressure of rubber-to-sheave maintains groove profile. Maintains constant pitch and speed ratio.

..."MORE USE PER DOLLAR"

*Poly-V is a registered Raybestos-Manhattan trademark.

R/M CONVEYOR BELTS FOR LONGER SERVICE

Extra flexible Ray-Man trains naturally, troughs easily . . . handles fuller, heavier loads even where narrow belts and small pulleys are required. Holds fasteners under severe conditions of use, requires no breaker strip. For severe shock loading, R/M makes extra-cushioned Homocord . . . and R/M Tension-Master for extra long lifts, high tensions. Exclusive "XDC" Cover protects R/M heavy duty belts against wear, tear, cuts and abrasions. Write for Bulletin # M302.

ALLFLEX HOSE IS STRONG *AND* FLEXIBLE

Exclusive engineered advantages of Allflex hose add up to easier handling, longer life . . . lower hose costs for a variety of uses. This versatile, all-purpose construction has no pre-set twist . . . coils and uncoils freely in any direction. Uniform inside and outside diameters assure safer, easier coupling. One of a complete line of quality R/M hose constructions for general and special purpose use . . . engineered for "More Use per Dollar" on every job ! Write for Bulletin # 7075.

RM 917-A

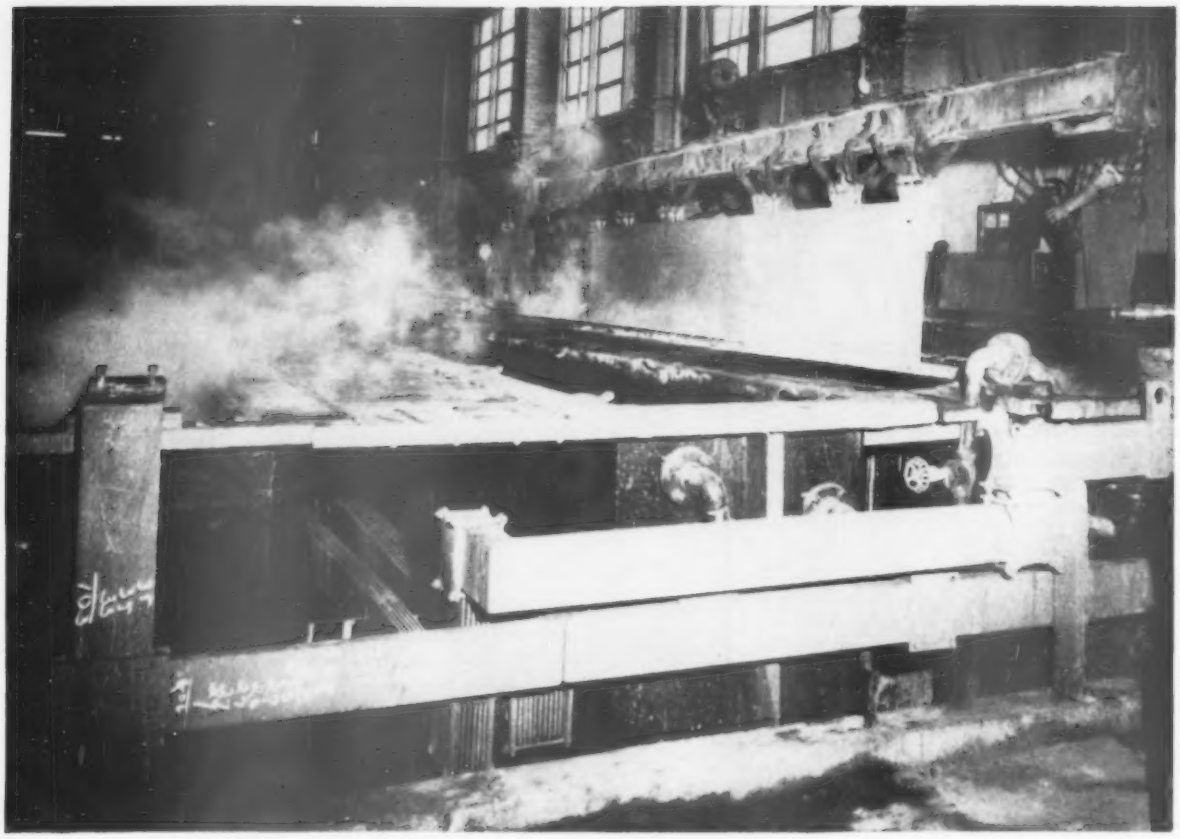
BELTS • HOSE • ROLL COVERINGS • TANK LININGS • INDUSTRIAL RUBBER SPECIALTIES

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products: Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

468 Poly V-Drives, 469 Conveyor Belt, 470 Hose



—Mr. L. P. Vollmuth. V. P. of Bart Mfg. Co., Belleville, N. J. talks acid tank protection:

"Bitumastic coatings have given us 2½ times the service life of more expensive materials"

Bart Manufacturing Co., producers of "Lectro-Clad" plate, pipe fittings and other electroplating processes, has a really tough corrosion problem on plating and pickling tanks. Protective coatings must withstand the fumes and occasional spillage of hot sulfuric acid and alkaline cleaning solutions. An expensive, complex coating system applied to the submerged tanks failed in just one year.

The tanks were removed from their pits, cleaned and given two coats of Bitumastic No. 50, the heaviest of the coal-tar based Bitumastic coatings. That was back in 1956 and on recent inspection, the Bitumastic coating system is still sound with no sign of deterioration. Bart makes extensive use of Bitumastic coatings in its other plants, too, where protection of chemical equipment is required.

Our files are filled with case histories like this, where firms have found coal-tar based Bitumastic coatings the answer to tough corrosion problems. We'd like to send you more information for your evaluation of these materials; it is likely they can help in *your* corrosion-prevention program as well. Use the coupon below, or write Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa.

District Offices: Chicago, New York, Boston, Los Angeles, Pittsburgh and Woodward (Birmingham) Alabama.

Koppers Company, Inc.
Tar Products Division
Dept. 135M, Pittsburgh 19, Pa.

Gentlemen:
Please send me additional information on Bitumastic Protective Coatings for industrial corrosion prevention.

Name_____ Title_____
Firm_____
Address_____
City_____ Zone_____ State_____

KOPPERS

BITUMASTIC
REG. U. S. PAT. OFF.
COATINGS AND ENAMELS

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FROM THE NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT...

NEWS about lighting's most versatile design elements

UNI-FRAME

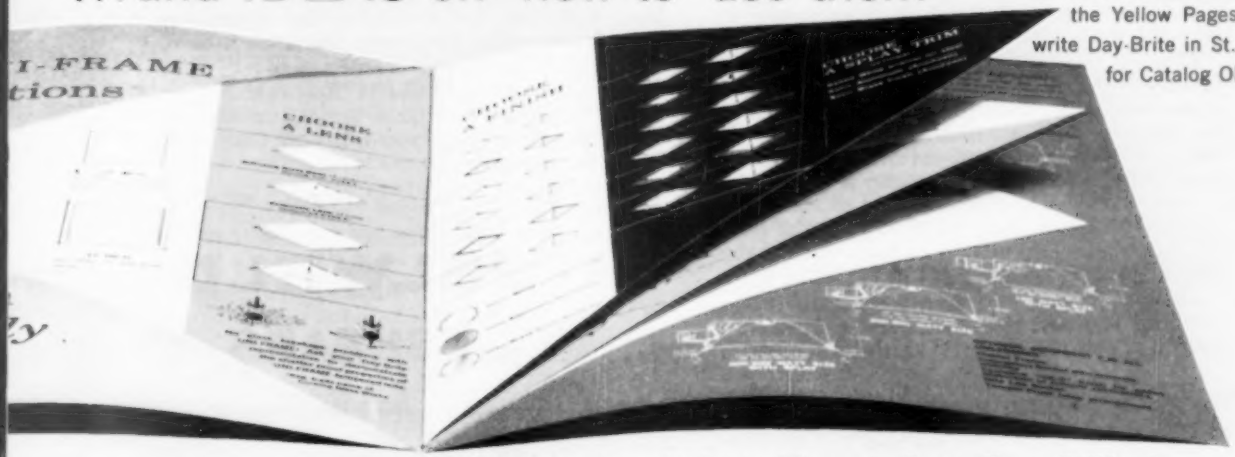
recessed incandescent lens box line by

DECIDEDLY BETTER
DAY-BRITE
LIGHTING FIXTURES

A-636

New smaller size for 100-150 watt lamps at lower price!
New diffusing glass bowl!
New matching splay trims!
New application ideas!
You'll find full details in this attractive UNI-FRAME booklet. Available from your Day-Brite representative listed in the Yellow Pages. Or write Day-Brite in St. Louis for Catalog OD-1036.

...and IDEAS on "how to" use them



Day-Brite Lighting, Inc. St. Louis, Missouri Santa Clara, California

For The *Best Cut*, The CORRECT KNIFE CLEARANCE Must Be Used

Steelweld Shears are available for all thicknesses of steel to 2 inches and for lengths to 30 feet. Electric foot-switch operation, as illustrated, is furnished as standard equipment.

In 10 seconds the knife clearance on Steelweld Shears can be adjusted to suit the thickness of metal being cut. It's merely a matter of turning a hand crank until the gauge pointer is on the proper figure.

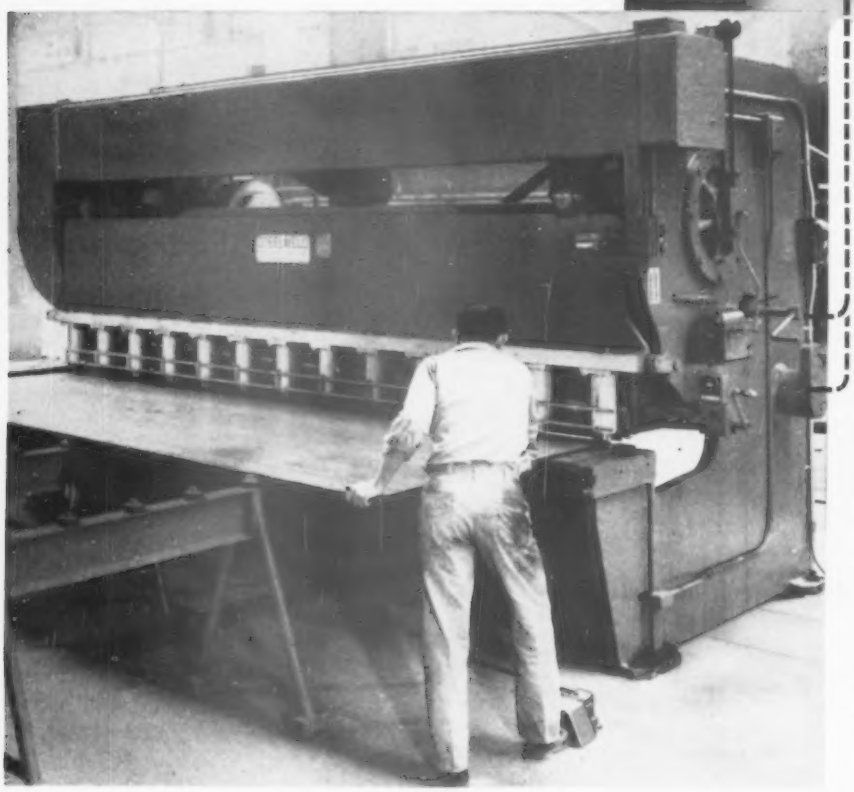


Table of Recommended Knife Clearances

Gauge	Steel	Stainless
10	.012	.007
8	.014	.009
3/16	.016	.010
1/4	.021	.014
5/16	.027	.018
3/8	.032	.022
1/2	.043	.029
5/8	.053	
3/4	.064	
7/8	.075	
1	.086	

FOR every plate thickness there is a definite space or clearance between the knives that will produce the best result. When cutting different thicknesses of metal, it is necessary to vary the knife clearance accordingly.

One of the important differences between Steelweld Pivoted-Blade Shears and all others is the ease with which the knife clearance can be adjusted on Steelwelds. With most shears this is a major operation involving the use of measuring devices and requiring a great deal of time. Steelwelds were designed to make this adjustment simple, easy and fast. Hours of work are not required, in fact, the adjustment for any plate thickness can be made in 10 seconds.

Obviously there is no need to shear with some compromise knife clearance setting when you have a Steelweld Shear. You do not have to accept any average cut when with such little effort you can have the best possible cut every time—sharp, straight, accurate with minimum burr. And then, too, remember that knives stay sharp longer when the proper clearance is used.

Easy knife adjustment is only one of many fine features that you will like in Steelweld Shears. For all thicknesses of plate up to 2 inches, for all lengths to 30 feet, you will find Steelwelds have much to offer.

Write for free copy of Catalog No. 2011. Gives construction and engineering details

STEELWELD

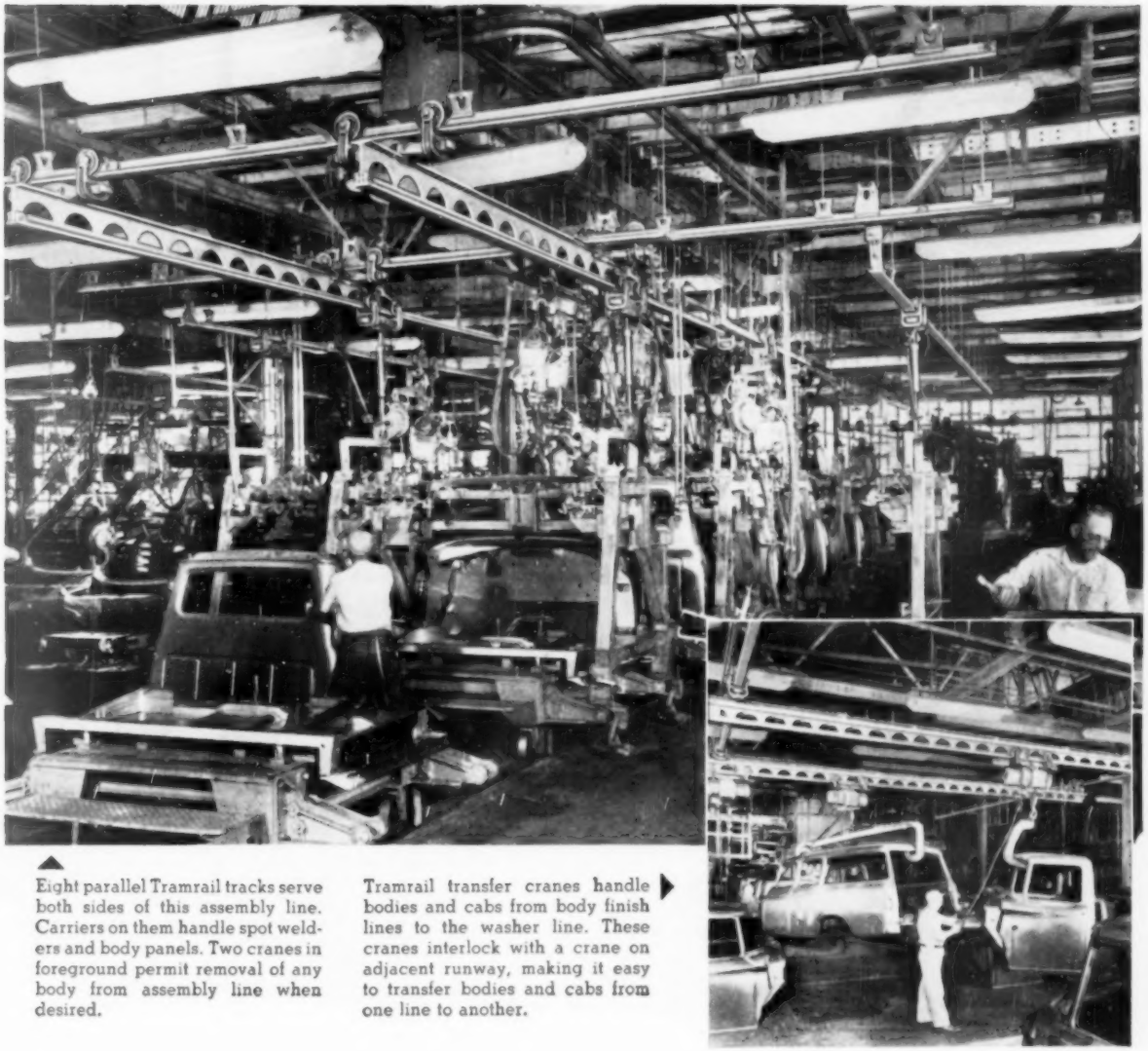
PIVOTED BLADE **SHEARS**

THE CLEVELAND CRANE & ENGINEERING CO. · 3255 EAST 282nd STREET · WICKLIFFE, OHIO

For more facts Circle 473 on Reader Service Card

CLEVELAND TRAMRAIL *DEPENDABILITY* FULLY PROVEN BY TRUCK MANUFACTURER

In Continuous Service for Nearly Quarter Century



Eight parallel Tramrail tracks serve both sides of this assembly line. Carriers on them handle spot welders and body panels. Two cranes in foreground permit removal of any body from assembly line when desired.

Tramrail transfer cranes handle bodies and cabs from body finish lines to the washer line. These cranes interlock with a crane on adjacent runway, making it easy to transfer bodies and cabs from one line to another.

IN a truck manufacturing plant every minute counts. Slow-downs or stoppages in any department cannot be tolerated because the operation of each directly affects the others. Here is where the quality of equipment really shows up.

Cleveland Tramrail has been in use for almost a quarter century throughout the large plant of a prominent truck manufacturer for a wide range of materials handling work. It has kept apace with production requirements.

The superior design and exacting standards to which Cleveland Tramrail is built, assures outstanding performance in the manufacture of trucks or other equipment. Cleveland Tramrail equipment can be depended upon.

WRITE FOR FREE COPY of Engineering and Data Booklet No. 2008. Packed with valuable information. Profusely illustrated.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3250 East 290 St., • WICKLIFFE, OHIO

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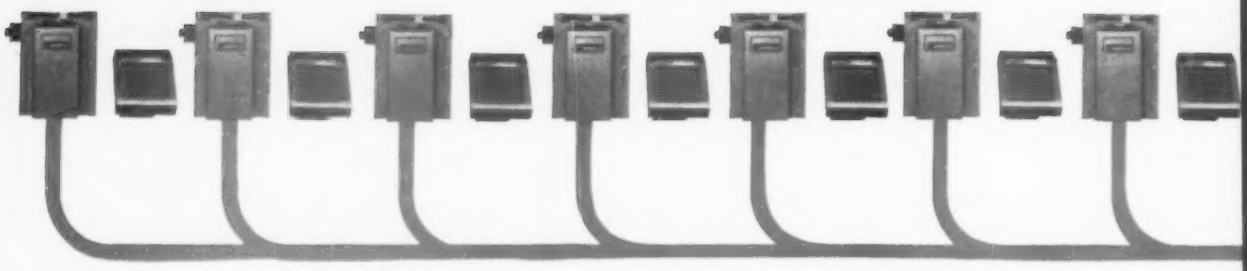


IBM® bridges the gap between factory source and management action...

IBM 357 DATA COLLECTION SYSTEM

Production line data must be "live" to be of use in management decisions. The new IBM 357 Data Collection System now makes this information available as soon as it occurs . . . in readily usable punched card form. The IBM 357 increases the volume and speed of data flowing from production line to management, yet drastically reduces the amount of paper work involved.

Each central receiving station of an IBM 357 System is served by up to 20 compact, wall-mounted input stations, strategically located near work areas to receive factory data directly from the production line. Facts fed into the input station are flashed to the recording center and automatically punched into IBM cards, ready for immediate processing. The IBM 357 System is compact, economical, flexible. It can be expanded or modified at any time to handle changing needs.

What Automatic Data Collection with the IBM 357 System can mean to:

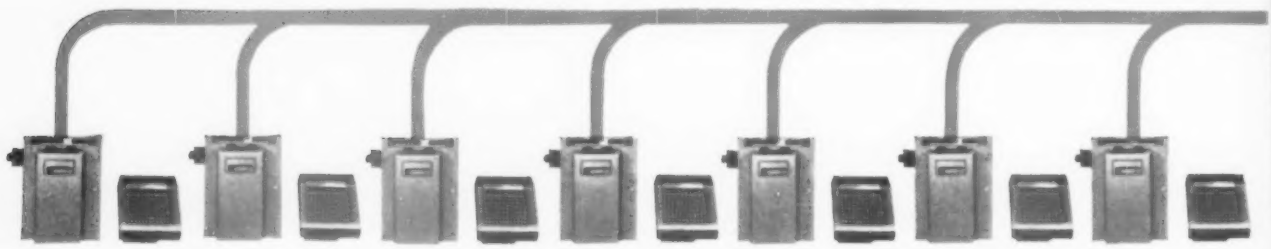
MANAGEMENT—Improved operating control based on timely, valid production facts

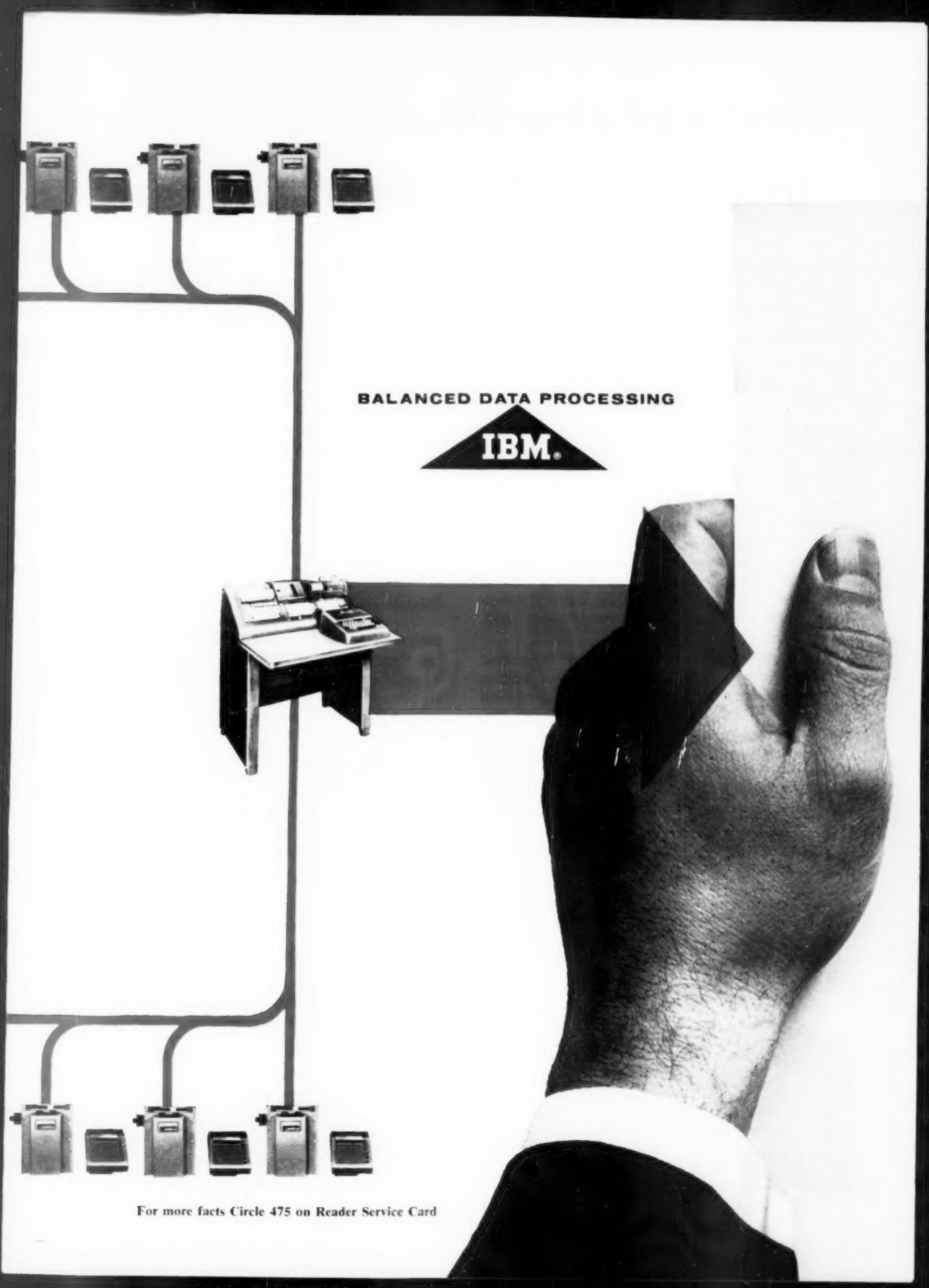
PRODUCTION—More efficient scheduling, based on knowledge of exact production status • Simplified time and job record processing

INVENTORY—Closer control of stock due to timely reporting of shortages, overproduction and scrap

MAINTENANCE—Up-to-the-minute record of machine status • Faster schedule adjustments • Immediate location of service personnel

Your local IBM representative can tell you about the many advantages of the new IBM 357 . . . call him today. IBM 357 Data Collection System, like all IBM data processing equipment, may be purchased or leased.





For more facts Circle 475 on Reader Service Card

Steel and aluminum users report increased values from Ryerson

These case histories—selected at random from our files, provide additional evidence that you consistently get increased value for your purchasing dollar from Ryerson. Individual points of difference between Ryerson and other sources may not by themselves seem overwhelming—but in total they add up to an important difference in dependability, experience and capacity to serve.

A world famous manufacturer formerly tested all steel purchased from steel-service centers for critical ordnance work. But, often, test costs on small lots of steel were greater than material costs. So the company decided to concentrate its purchases with sources proved completely reliable—and discontinue its own testing. Experience showed that the required certifications of quality were always absolutely dependable in the case of only three steel suppliers—among them Ryerson where quality has been a watchword since 1842.

Milling operation eliminated. A structural fabricator followed the usual practice of milling the ends of beams to be used as column bases until he discovered the accuracy and squareness of Ryerson friction sawing. Now he has eliminated the milling operation because, at no extra cost, Ryerson can guarantee friction saw accuracy of only ± 1/16" for beams up to 6" and ± 1/8" for sections over 6"—squareness tolerances of .010" per inch of section.

Better product appearance and a worthwhile saving in material cost resulted when a Ryerson man recommended that a producer of portable coolers switch from one aluminum alloy (3003-H14) to another (5005-H14). Slightly higher structural strength was a bonus value. Unusually broad aluminum stocks and technical resources often enable Ryerson to serve in this way.

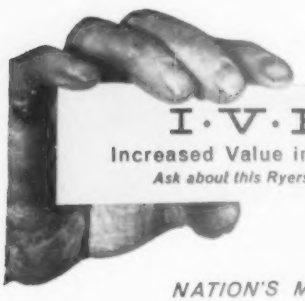
The need was urgent. A breakdown was cutting output of a big paint producer, and the steel needed to repair the break was not available in the area. However, the required analyses and size *was* on hand at the nearest Ryerson plant 200 miles away—and within an hour Ryerson delivered 100′ of this bar stock to the local airport. Three and a half hours after calling Ryerson in another state, the customer had his steel.

"Deeper cut, better finish, longer tool life, and lower total per-piece cost." These were the results reported by a Mass. machining company after it switched to Ryerson Rycut® 40 alloy steel for shafts, gears and spindles used in rugged machine tools. Ryerson Rycut steels are the world's fastest machining in their carbon ranges.

Missile component problem solved. Titanium stringers in stainless forged bars were creating a high reject rate for a missile parts manufacturer. His Ryerson specialist recommended a switch from Type 321 stainless to Type 347. Results: the same stabilized corrosion-resistance and strength—but no titanium stringers.

Furniture manufacturer saves 15¢ per unit on every chair produced. A *rolled* aluminum angle was being used where strength was not an important factor. A Ryerson aluminum specialist suggested an *extruded* angle which gave all the strength needed in the application, was more easily formed, had better appearance—and reduced costs as well.

These are just a few examples that illustrate the advantages that make Ryerson service truly unique. A call to your Ryerson representative may solve similar problems for you.



RYERSON CERTIFIED QUALITY

RYERSON STEEL®

Joseph T. Ryerson & Son, Inc., Member of the JLAM Steel Family

STEEL • ALUMINUM • PLASTICS • METALWORKING MACHINERY

NATION'S MOST COMPLETE SERVICE CENTERS IN PRINCIPAL CITIES COAST TO COAST

For more facts Circle 476 on Reader Service Card

FACTORY

FACTORY PRESS TIME REPORT • DECEMBER 1959

Looking Ahead in Business

You'll see a sharp rise in capital spending next year. This is clearly indicated in the latest McGraw-Hill preliminary survey of capital spending plans.

Expenditures for new plants and equipment by all business in 1960 will be 10% higher than in the current year, according to present plans. Manufacturers now expect to increase capital expenditures by 19%. Virtually all groups plan sizable increases in capital outlays in 1960. For all business, planned spending comes to $37.3-billion; for manufacturing, to $11.9-billion.

•

Here is the line-up of capital spending now planned for 1960:

• **In iron and steel,** outlays will be up 76% over 1959. Total expenditures will be $1670-million.

• **Auto industry** (including trucks and parts) plans to increase capital outlays 30% to $841-million.

• **Machinery manufacturers** capital spending—electrical and non-electrical—will be up by 22%.

• **In chemicals,** capital expenditures will rise to $1473-million, a 24% increase over 1959.

• **Rubber manufacturers** plan to up outlays 31%.

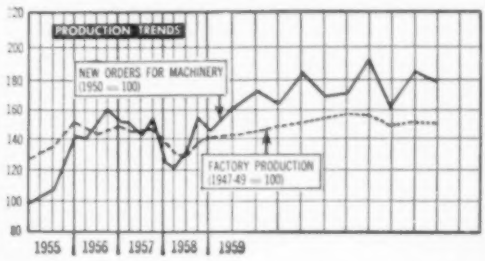
• **In paper and pulp manufacturing,** spending for plant and equipment will be 35% higher in 1960. Spending planned by other manufacturing industries shows less substantial increases over this year's level. In some, slight cuts are now planned. But these may be reversed in final plans.

•

Capital expenditures in non-manufacturing industries will also rise in 1960. But these increases will be less impressive than those for manufacturing. Total capital spending in non-manufacturing will come to $25.3-billion—up 6% over 1959.

The survey was completed in October. Thus it reflects business thinking when the full pinch of the steel strike was being felt. It also clearly indicates that capital spending planned by some industries for the latter months of 1959 had to be deferred until 1960 because of the strike impact.

FACTORY FIGURES OF THE MONTH



Indicator	Oct. 1959[p]	Sept. 1959[r]	Oct. 1958
New Orders for Machinery (exc. elec.)[1]	180.0	183.0	152.0
Contracts for Industrial Construction[2]	169.0	171.0	61.0
Factory Production[3]	151.0	152.0	140.0
Consumers' Prices (cost of living)[4]	125.3	125.2	123.7
Industrial Prices (materials, supplies)[4]	128.5	128.4	126.4
Manufacturing Employment (millions)[4]	16.2	16.4	15.5
Total Employment (millions)[5]	66.8	66.3	65.3
Unemployment (millions)[5]	3.3	3.2	3.8

[p] = preliminary [r] = revised

Sources: 1. McGraw-Hill Department of Economics (1950 = 100); 2. Engineering News-Record (1950 = 100); 3. U. S. Federal Reserve Board (1947-49 = 100); 4. U. S. Department of Labor, Bureau of Labor Statistics (1947-49 = 100); 5. U. S. Department of Labor, Bureau of Labor Statistics.

Spending plans for 1960 are based on optimistic sales forecasts for next year. Manufacturers on the whole look for a 9% increase in sales volume. Biggest sales increases are expected by industries whose sales were cut by steel shortages this year.

Steel expects sales volume to be 25% higher than 1959. Sales of autos (trucks and parts included) will be up 15%, machinery sales up 11%, chemicals up 9%. Sales gains expected by other industries are more modest. But every major manufacturing industry expects an increase in sales volume.

The survey also indicates tight money won't be a serious problem for most firms planning capital outlays for 1960. Companies reporting financing plans expect over 80% of needed funds for capital spending to come from internal sources—retained earnings and depletion or depreciation allowances.

Capital spending thus will give business a solid boost in the coming year.

FACTORY PROBLEM-SOLVING GUIDE

1.0–1.4 Plant Maintenance and Engineering

MANAGEMENT AND PRACTICES (1.1)

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BUILDINGS AND YARDS (1.2)

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THIS SIMPLE FILING SYSTEM is designed to give quick access to past FACTORY articles that can help you solve current operating problems. Here's how it works:

1. All major articles and many short items are classified according to a functional code. Codes cover basic operating responsibilities.
2. Certain articles are also coded (see numbers in parentheses) to show secondary or closely related topics.
3. To use, cut up the items below. Paste them on 3x5-in. cards, file by code number. To cross-index, copy information on a second card, file by secondary code.

For an outline for a complete decimal filing system (DFS), see FACTORY, November 1959, page 29.

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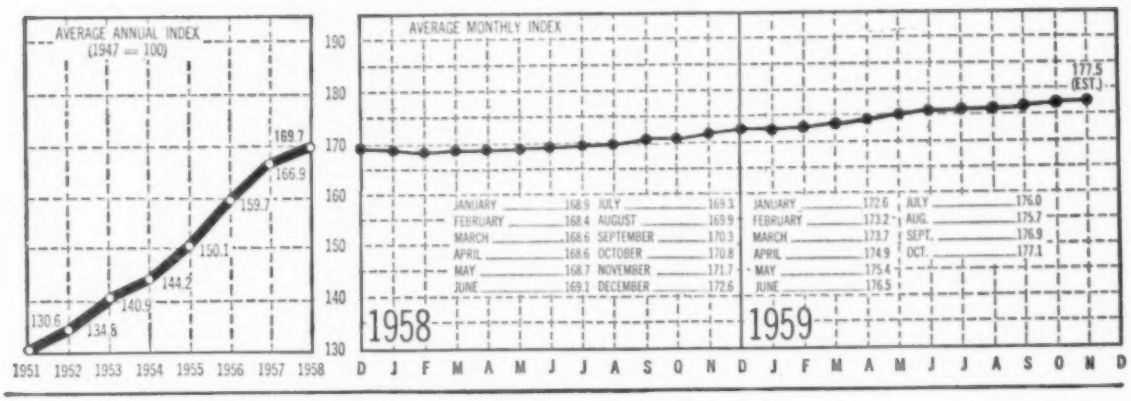
FACTORY PRESS TIME REPORT • DECEMBER 1959

Cost Index of Plant Maintenance



Index Still Climbs Up

Non-inflationary steel settlement would raise 1960 maintenance cost modestly.

FACTORY'S Cost Index of Plant Maintenance is resuming its upward climb to new high cost records every month. October costs averaged 77.1% above the 1947 base cost level of 100. And it now looks as if the Index will move up again in November to a level of 177.5.

Maintenance costs rose only fractionally in October—about 0.1%. Nevertheless, the October Index was about 3.5% above costs in the comparable month of 1958. The reason for the small gain in costs in October can be traced to the fact that labor costs held even during the month. Actually labor costs in the building and facilities category were slightly higher in October than September. But they were slightly lower in the equipment category.

Over-all materials costs were up in October—almost 0.3%. Costs were reduced on only three items—lumber, abrasives, and non-ferrous alloys—out of the 39 materials on which cost data are collected by FACTORY's statistical staff. Costs of 24 other items remained at the same level as in the previous month, while the remaining 12 materials registered increases.

Materials costs were up in both major maintenance categories. Materials priced in the equipment category of the maintenance index rose by 0.3% while materials costs in the building and facilities category only inched up.

Present negotiations between steel management and steel union continue to suggest that a non-inflationary wage pact will result when final agreement is reached. This would mean a modest maintenance cost increase in 1960.

	AVERAGE 1958	OCT. (Preliminary)	SEPT. (Revised)
Building and Facilities Index	**160.8**	**168.5**	**168.2**
Materials	139.2	141.9	141.8
Brick	148.8	153.0	153.0
Elec. fixtures	128.9	131.4	130.8
Elec. switches, boards, fuses	181.5	187.8	187.8
Elec. wire, copper	122.5	139.0	139.0
Glass	152.2	152.0	152.0
Gutters, spouts, ducts	172.9	178.5	177.1
Gypsum products	139.8	140.8	140.8
Heating equipment	127.4	127.5	127.4
Lumber	124.9	135.4	136.9
Millwork	146.9	158.9	158.9
Paint	130.1	130.1	130.1
Pipe, cast iron	170.4	170.4	170.4
Pipe, steel	192.0	191.3	189.9
Pipe & tubing, copper	145.7	154.4	152.3
Roofing	120.4	117.7	117.7
Sanitary fixtures	145.0	156.0	156.0
Sash, metal frame trim	146.9	139.0	139.0
Solder	117.5	125.6	125.6
Steel, structural	231.3	236.3	236.3
Tanks, steel	138.4	139.0	138.7
Valves & fittings	160.6	171.1	170.0
Wire mesh	160.8	162.9	162.9
Labor	175.2	186.2	185.8
Carpenters	160.7	171.6	171.1
Electricians	183.5	194.9	194.9
Painters	181.3	192.0	191.4
Equipment Index	**173.6**	**180.8**	**180.7**
Materials	173.5	178.1	177.5
Abrasives	160.3	160.6	161.4
Alloys, non-ferrous	117.2	125.4	126.7
Bars & plate, steel	223.5	227.2	227.2
Bearings	163.4	164.6	164.6
Belting	150.5	159.5	158.6
Bolts, nuts & screws	229.5	229.4	225.9
Chain	184.0	184.0	184.0
Controls (electric)	181.5	187.8	187.8
Gear-reduction units	181.7	181.7	181.7
Hand tools, mechanics	192.9	198.3	198.3
Lubricants	122.8	125.7	125.7
Motors	147.2	146.4	146.4
Non-ferrous metals	120.9	131.2	129.0
Precision tools	153.2	157.5	157.5
Pumps	184.8	194.8	194.8
Tools, cutting	166.3	177.1	176.3
Valves & fittings	160.6	171.1	170.0
Labor	173.7	182.6	182.8
All mfg. labor	172.2	178.7	179.5
Machine tool labor	175.2	186.5	186.1
FACTORY'S COST INDEX	**169.7**	**177.1**	**176.9**

FACTORY PRESS TIME REPORT • DECEMBER 1959

Looking Ahead in Labor

First clues to workings of the new Taft-Hartley rules are being cautiously provided by Stuart Rothman, general counsel of the National Labor Relations Board. His words provide both labor and management with vital indicators of what to expect from the 1959 labor reform law. He is the first to meet the new law head-on. He decides if unions and employers are violating it, acts on complaints from either side. If he agrees there is a possible violation, the case goes to the five-man board. If he disagrees, the case is dropped and no appeal is allowed.

Rothman, anticipating an onslaught of new labor cases, has already over-hauled national and regional offices of the general counsel. He has shaken up his 1200-man staff, has revised procedures to speed up case handling. Now the 45-year-old government career attorney is laying the ground rules of the revised Taft-Hartley Act.

•

Here's the way Rothman interprets key provisions of the law:

• **The "biggest change" is new curbs on picketing or threats of picketing.** An organizational picket line must be withdrawn within 30 days and a petition filed with the NLRB for a representation election to be held "forthwith." However, Rothman warns, "expedited elections won't be held until the employer or some interested party files a written charge of illegal picketing or threat of picketing." Then his office can proceed only if it's established the union is forcing the employer to bargain or compelling his employees to join the union.

• **A "most complicated" section—the secondary boycott ban.** This outlaws "almost every effort" to embroil a neutral employer in a union's appeal to employees, foremen, other supervisors. Also deals with picketing or other economic action against the neutral employer. The law specifically allows, says Rothman, "truthful union publicity about a labor dispute." Although the union cannot picket, it can use handbills or radio and newspaper advertisements to tell the public a neutral employer is handling products of an employer involved in the dispute. But these tactics cannot interfere with pick-up or delivery of the neutral employer's products.

• **A "far-reaching effect"—strikers voting in representation elections.** Workers out on strike for wages or other economic gains can now vote in a representation election at their plant, along with new employees who have been placed in their jobs. For the strikers to take part, the vote must come within 12 months of the start of the strike. Their right to vote, however, is not automatic. Advises Rothman: "The NLRB may well conclude that strikers who engage in serious misconduct during the strike should still be barred from voting. The law has always permitted an employer to discharge a striker on the grounds of misconduct."

• **A former "plague" to small employers—no-man's land.** State courts and labor agencies may now handle cases that are not under the Board's jurisdictional yardsticks. This includes the rule that to meet the federal test manufacturing companies and wholesalers must buy or sell, directly or indirectly, goods or services outside their home state amounting to at least $50,000 a year. Where there is a "close case" involving jurisdiction, either the parties or the states involved may submit a petition to the NLRB for an advisory opinion on where the case rightfully belongs. The Board will issue written opinions to all such petitions, which must be filed with the executive secretary of the NLRB in Washington, D.C.

•

Despite the NLRB's preparations, don't look for quicker decisions on unfair labor practice complaints. Even with Rothman's impressive speed-up in case handling over the past three months under the old T-H rules, the Board hasn't made a dent in the case backlog on hand. And cases are coming in at record levels. In the third quarter of 1959, there were 2946 complaints from labor and management and 2430 election petitions. The Board's case-load now stands at a total of 7468 in its regional and national offices. So prospects for speedy settlements are not good.

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Furthermore, the new Taft-Hartley rules are expected to swell the NLRB's work, making sure the Board will demand a sizable increase in operating funds from Congress. Rothman's offices already have been given an extra $500,000 to handle the anticipated new rush of business.

SEE LABOR RELATIONS NEWS, PAGE 164

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FACTORY OPINION

Failure at the Bargaining Table

With the steel negotiations still at an impasse, the American public is now getting some idea of what plant management people face at the bargaining table. And the public is getting just about fed up. But what it does not know is that truly two-sided collective bargaining in industry has ceased to exist for a long time.

The Taft-Hartley and Griffin-Landrum laws notwithstanding, plant management's efforts to improve productivity and profitability through union negotiations are largely futile. This is because what is naively described as collective bargaining isn't really bargaining at all.

In negotiations the union typically wishes only "to go ahead." "Going ahead" means more money and greater restriction on plant management's flexibility—to meet cost and inflationary pressures. On the other hand, corporate management typically wishes only to settle the contract as quickly and as cheaply as possible. It, as well as the union, pays only casual attention to the matter of resolving problems of employer-employee relations. Both sides pay only casual attention to the operating difficulties of plant management. They quickly bring pressure to bear on the more immediate issue of wages. The reversal of this familiar performance is what has caused this year's steel negotiations to jam.

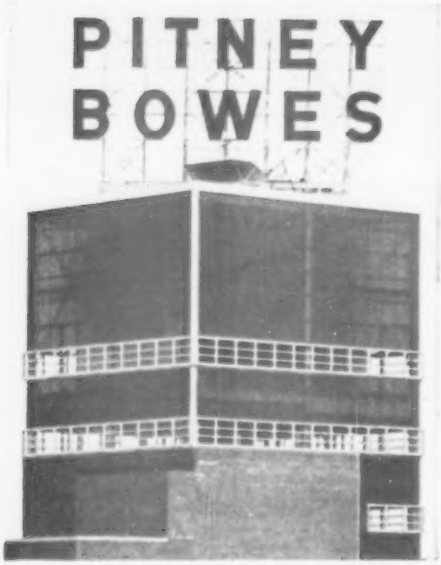
Top management in the steel industry has finally recognized the dire necessity of securing positive and specific concessions from the union so that plant management may achieve greater productivity from its resources—material as well as human. But, unfortunately, these are local operating matters that remote management and international union officials know little about. They know less about how to resolve them. No wonder the negotiations have failed.

It seems obvious that no new law or pressure from Washington will cause our collective bargaining process to improve. What is needed is a new attitude on the part of labor *and* management. Both parties must realize that employer-employee relationships and points of reference cannot be frozen. These relationships must be free to move in any direction. They must yield to the forces of free competition on the one hand and the consideration of the well-being of workmen on the other.

Collective bargaining will not be improved by the power plays of union leaders. It will not be aided by inflexible demands for management rights. It will be improved only by first effecting a better day-to-day relationship at the plant level. And then by recognizing management's as well as employees' interest in all matters pertaining to wages, hours, and working conditions. The union is not the sole protector of these conditions. Management also has its responsibility to protect them and to improve them in the light of the ever-changing needs of daily plant operation.

Les Buttel

EDITOR-IN-CHIEF



THIS SLEEK TOWER

rules over the tossed sea of roofs below

The six plants under the roofs function like a single new one. Yet the oldest dates back to 1919, and the newest, topped by the tower you see, has just been completed.

The tower encloses two 50,000-gal. water tanks. Glass-fiber sheeting covers three sides.

The tanks (they're round) occupy the sixth and seventh floors of the new building. Other floors house a 3-D layout model, company museum, and engineering operations. Filtered exhaust fumes from the finishing room are vented from top of the structure.

Under these roofs are six plants. Most are old.

They Work Together as One That's NEW

Instead of six multi-floor plants, Pitney-Bowes, Inc., Stamford, Conn., needed one 240,000-sq.-ft. single-level manufacturing area. And the company has it now, after a top-notch modernization job. Problems? There were plenty. There were walls, columns, doors, and even different floor levels to contend with in the buildings. But P-B considered the ground floors of all six buildings as one in planning over-all layout.

Modernizers planned around fixed obstructions like columns and supporting walls. Doors were a minor problem. Construction crews just plugged up the old ones, opened up new entrance ways to coincide with the path of long, straight aisles. Differences in floor levels were equalized with ramps. Thus the plant has aisles running through building after building.

As for equipment, P-B boasts that not one of its 700-odd machines remains in its former position. In most cases, old department layouts had evolved without a long-term plan. In the past, as a new machine was purchased, it was placed where floor space existed—not where it fitted into the over-all process pattern. The modernization program changed all this.

Every department has been reorganized completely. In most cases layouts have been opened up to provide better working conditions around individual machines. Lights have also been rearranged to provide better illumination. And every machine has a new coat of paint. Manufacturing departments are color-coded by function. Machining areas, for example, are painted gray and blue. Inspection stations are painted yellow.

NEW layout

Walls weren't sacred to the modernization men at P-B. If the best floor plan called for cutting a new door in plant walls, it was done.

Differences in floor level didn't stop the modernizers either. Ramp above smoothes out the 24-in. difference between two buildings.

Most aisles are 8 feet wide. Traffic moves smoothly. Handling within and between departments is easier, faster. Punchpress department (above) has 33% more floor space. Angled layout means handlers can supply presses without interrupting nearby operations.

NEW equipment

Postage machines are assembled on four conveyor lines. They run as long as 200 feet. Machines ride on special pallets, so they are easily moved from station to station. Handlers place major components on shelves at far side of the 24-in.-wide conveyors. Trays along front of conveyor hold small parts such as bolts and screws. Each station has an individually fused electrical outlet and air valve. As they come off assembly conveyors, finished units are immediately boxed, then moved to the fully enclosed shipping area nearby.

Turn the page

Sparkling clean manufacturing areas are no surprise in a brand-new plant. But they're a scarce blessing in plants more than a few years old. FACTORY editors know. They visit hundreds of manufacturing plants each year.

For cleanliness and efficiency, these modernized facilities belong in the same league as the newest.

Why did Pitney-Bowes management go to all this trouble to modernize? Why didn't it just build a completely new suburban plant and abandon the old site? In the long run it might have been the easiest—if not the most economical—solution to its problem. But here's how Fred A. Groesbeck, the company's manager of properties, explains the decision.

"We based our decision to modernize and add to our existing plant area on two main points. First, our existing buildings were structurally sound. So it was more economical to modernize at a cost of roughly $10 per square foot than to build a new facility at a cost of at least $13 or $14 per square foot. Second and equally important, we have always been a Stamford company and wanted to retain this identity. It's hard to put a

Clean Machining

This is the toolroom. It's on the second floor of a building that was built in 1952. The modernized area is slightly larger than it was previously. Additional operating space resulted from the removal of tool inspection operations to another area. This enabled Pitney-Bowes to relocate all 50 machines for better, more efficient operation. Repainted machines and relocated lights added to the appearance of the area.

The company makes the most of its own production tools. Always has.

Breezy Painting

The stovepipes you see hanging from the ceiling in this photo are intake ducts for an air wall. Air is forced in through them, flows out through the paint booths. There is constant positive air pressure in the area.

Paint booths are clean even though workers perform sanding and polishing in immediately adjacent area. Curtain affords flexibility in layout of department but still keeps dust out of paint stations. Air from the curtain exhausts through the paint booths, carries contaminants with it through filters to the outside.

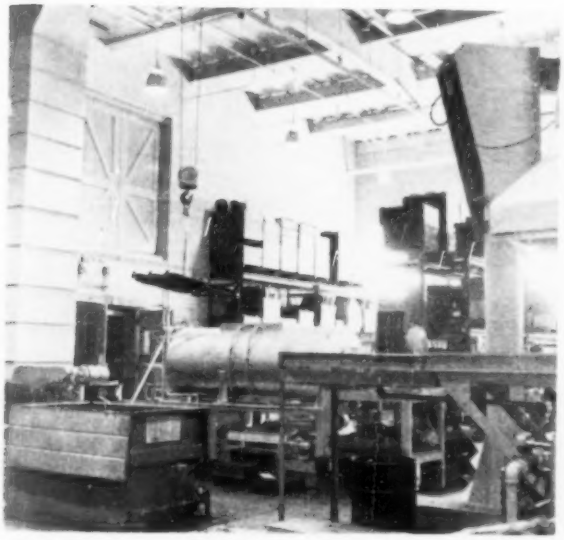
dollars-and-cents value on the excellent community and employee relations we have enjoyed and encouraged over the years. But to us it represents an intangible asset we didn't wish to jeopardize."

Early last month, Pitney-Bowes invited employees, their families, community leaders, and customers to tour their newly modernized facilities. FACTORY visited them too. One big surprise for the editor who made the visit is revealed in the three photos of the finishing facilities below. There's nothing dingy, damp, or dirty about them. And that's a surprise. They occupy a new 41,000-sq.-ft., 1½-story plant addition. Interior walls of the five spacious, well-lighted finishing rooms are tiled in different colors. Floor specifications differ with the function of each room.

The building addition rests on a floating foundation. It's waterproofed to a height of 12 feet to protect equipment against floods (a recurring problem in the Stamford area, because of hurricanes). All air exhausts downward. Contaminated air is carried off underground to the seven-story water tower structure, then vented out the top through filters.

A 29,000-sq.-ft. basement houses exhaust units, chemical treatment equipment, atmospheric generators and the like. Most services come up from the basement, too. Some electricity is supplied by overhead bus duct.

The toolroom (photo left below) was another pleasant surprise. It's as bright and shiny as a new penny. There, P-B makes most of the production tools used throughout the operation.

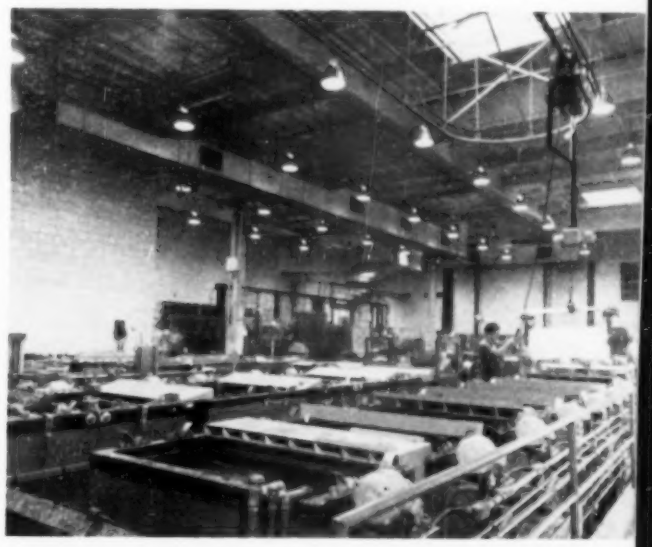


Neat Heat Treating

Tile on the walls, new mercury vapor lamps, newly painted ceiling—all make this heat-treat room a pleasant place to work.

The double door you see 10 feet up on the wall opens into a 2400-sq.ft. service mezzanine. Located here are four motor-generator sets plus eight rectifiers to supply d-c power. The door makes installation and removal of units easy. When the door is opened, a lift truck can handle them from the heat-treating room.

Washrooms and lockers for 100 finishing-room employees are also on the mezzanine.



Bright Plating

This plating room gives genuine pleasure to employees (and visitors).

High clearance makes it easy for workers to move parts from operation to operation with overhead hoists. Ceiling height throughout is over 20 feet.

Color-corrected mercury vapor lamps coupled with natural light from skylights contribute to the wide-open feeling.

The orderly arrangement of cleaning and plating tanks simplifies the operation, makes it one of the most efficient we've seen.

Turn the page

Employees at Pitney-Bowes enjoy pleasant working areas, excellent facilities (such as washrooms and locker areas), deluxe lunch and relaxation spots.

Few new plants offer a better, more pleasant place to work. The results: High morale. Good employee relations. Low turnover. Employee pride.

Modernization of employee facilities started with enlarging and refixturing of washrooms. Went right on up to the dining-room area housed in a new penthouse-like addition atop the main office building. Adding it all up, it shows the concern P-B has for its employees' comfort and welfare.

A prime example is the eating facilities. There are three types. All are modern and the quality of the food is supervised by a master chef. P-B is quick to point out that all employees are free to eat in any of the three facilities they choose:

- For a fast snack or lunch, there are 10 vending machine centers in plant and office areas. These offer hot and cold food and drinks.
- For a self-service meal, P-B subsidizes a cafeteria

Comfort Working

Engraving stamp meter dies, a service operation, is done in a pleasant area on the second floor of the newest plant building. Windows facing south and west in the new addition have tinted glass. Reason: employee comfort.

Windows are nice, but not terribly unusual. The real comfort clincher hangs at the side of the windows. To eliminate glare on even the brightest day, each window sports glass-fiber drapes that can be drawn across.

To promote worker safety, moving machine parts are painted yellow. Controls are orange.

Posh Dining

This looks like a dining room for VIP's. It is. It's open to all Pitney-Bowes employees who prefer a served meal to self-service vending machine or cafeteria lunches.

Plant employees often visit the dining room when they have something to celebrate, such as a wedding, promotion, or retirement.

Restrictions on use of employee facilities just aren't in the P-B code of management manners. This dining room is an example. It's designed to hold 200 diners. It's often used at night for employee testimonials and parties.

built in 1947. During the modernization, the serving area was doubled (it now boasts three lines) and completely refitted with stainless steel equipment. The cafeteria itself was completely redecorated, has a new stage curtain and drapes. Lights have been recessed and a new tile floor installed. Since this is the largest auditorium area in Stamford, it's used for community activities as well as company-sponsored affairs.

The cafeteria can seat 1200 as an auditorium. That's the reason for a set of monorail-hung, sliding doors. During self-service feeding, the doors are stored in a closet to the right of the service counter. But when the cafeteria is converted to an auditorium, the room takes on a bright new look. The multi-colored doors are rolled out to cover the serving counter.

• For a served meal, all employees can use the new dining room. It holds 200 people. Occupies a new 3500-sq.-ft. addition overlooking the entire property. This area is also used at night for employee parties.

The new 2000-sq.-ft. playroom is next to a cafeteria entrance. Formerly, this area was devoted to office space while a smaller recreation area was set aside inside the cafeteria.

The P-B modernization wasn't a short-term undertaking. Actual construction on the $8.5-million-plus project started in December 1956 with ground-breaking for the new 265,000-sq.-ft. three-story addition. Since then employees have witnessed continual changes in the function and appearance of plant areas. But always with minimum interruption of work.

Convenient Lunching

Banks of vending machines meet the needs of employees who want to lunch in a hurry—or supplement a lunch brought from home. There are 10 banks of the machines scattered throughout the manufacturing areas. They offer a complete hot lunch—with soup, main dish, salad, dessert, and beverage.

There's a main cafeteria too, for workers who prefer a more complicated lunch, but not the state-occasion atmosphere of the swank dining room. The cafeteria seats 400. It can be converted to a 1200-seat auditorium.

Easy Relaxing

After lunch, employees with the urge for relaxation have a place to go that caters to that urge. It's the newly enlarged recreation room planned for the purpose.

In the room are Ping-pong tables—four of 'em, shuffle boards, reading material, and a comfortable atmosphere in which to pass spare minutes just visiting with friends.

The new recreation area encompasses 2000 square feet of floor space. The space used to be used as an office area. Colorful drapes and new lighting add to the cheeriness of the room.

Turn the page

For all their brightness, the offices below have a dark past. The area once held plating and finishing operations.

The appearance change is obvious. But the atmosphere in the area today is vastly changed in another way, too. Gone are the finishing fumes. Like the rest of the plant, offices are now air conditioned.

Take six multi-floor buildings, convert them to a single floor layout, and you're bound to have a lot of space left over on upper floors. That's where Pitney-Bowes modernizers put many of the offices that were built to give the office force more room.

The offices are uniformly bright, cheerful, and efficient. And no wonder. Plenty of thought was given to every detail. For example, the factory-type steel sash on most of the office areas could have been treated conventionally—with venetian blinds or glare-reducing paint. Instead, they're hung with glass-fiber drapes. Result: They're good-looking. The maintenance costs are much lower than they would be with blinds. And the center, swing-in sash can be opened without disturbing the window arrangement.

Pleasant Accounting

This office area has been brightened, renovated, refloored, and made about as pleasant and efficient as any we've seen.

Lighting fixtures for the area were chosen as the best solution to the ceiling arrangement. Rows of fixtures maintain a constant height in spite of differences in ceiling height and obstructions such as air-conditioning ductwork.

Look carefully along the left side of the picture. You'll see neat floor-to-ceiling drapes on the windows. They're translucent, so they admit light even when they're drawn.

Modern Mailing

Pride and joy of the modernization planners is this mailroom. It's a 3000-sq.-ft. area in the original 40-year-old plant building. It handles all mail, and serves as a proving ground for new Pitney-Bowes machines.

This room, like the other offices, has drapes at the windows. Flourescent tubes and air-conditioning ducts are concealed above the honeycomb-type dropped ceiling. Working surfaces are almost completely glare-free.

Layout of the mailroom makes it a model of efficiency as well as looks.

But there's little need to open windows any more. That's because both plant and offices (except for three small finishing areas where air conditioning is impractical) are now cool and comfortable even during the hottest summer months. Because of varying cooling requirements throughout the different areas, a centrally controlled unit system was installed. It employs over 100 units that range in size from 5-ton packaged conditioners in offices to 100-ton built-up units in some of the manufacturing areas. Total cost of air conditioning was $1,250,000.

The second-floor offices have another bonus to offer. They're high enough to be out of danger during floods. Stamford (Conn.) has a history of hurricane-caused high water. That history was carefully considered in the modernization planning. Here are some of the arrangements made to foil the flood waters:

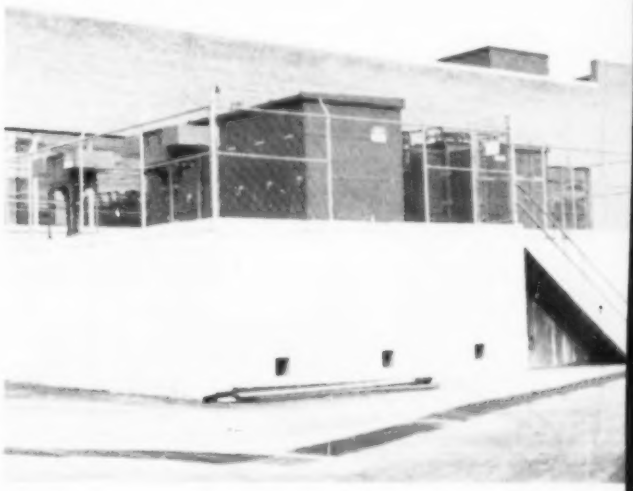
- The building addition that houses the finishing operations is completely waterproof to a height of 9 feet. Bulkhead doors can be locked tight to keep water out.
- The basement under the finishing addition is waterproofed to protect the equipment there.
- All automatics in the machine shop operation were moved to the second floor, so flood waters wouldn't be able to reach 'em. Punchpresses were stationed on the first floor, because their motors are mounted high enough to be out of reach.
- The wood-block floor in the punchpress section was replaced with concrete. Reason: In past floods the blocks had loosened, floated all over the shop.

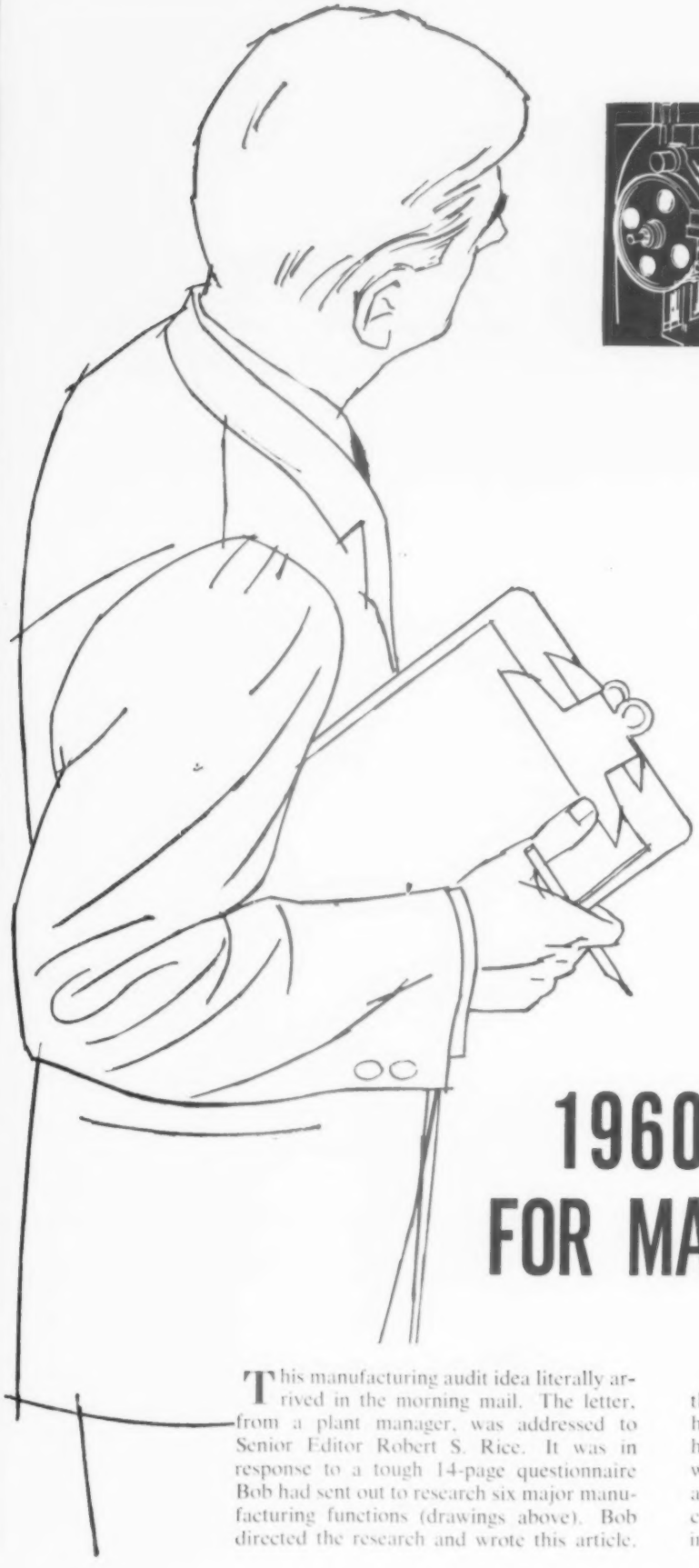
Planned Flood Control

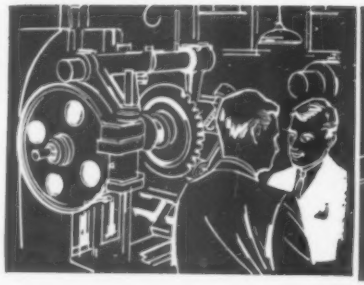
The substation at right enjoys a 12-ft.-high perch on its concrete block house foundation. This puts it well above hurricane flood-water level. From the substation, power feeds to both radial and loop distribution systems.

The bulkhead doors to the storage area for finished parts (lower photo) can be clamped shut to waterproof the building. The 13,000-sq.-ft. storage area is located right next to the finishing departments to save on handling time and costs. The storage room doors (not the bulkheads) are air-actuated—another move to save truckers' time.

The major consideration in this modernization was to "get everything under the roof." Formerly, P-B used five auxiliary buildings within a two-block radius of the main plant for satellite manufacturing operations. Naturally, this meant plenty of trucking back and forth. The outlying buildings were put up over a period of years as "spur of the moment" sources of added production space. In the future they'll be used only for dead storage.





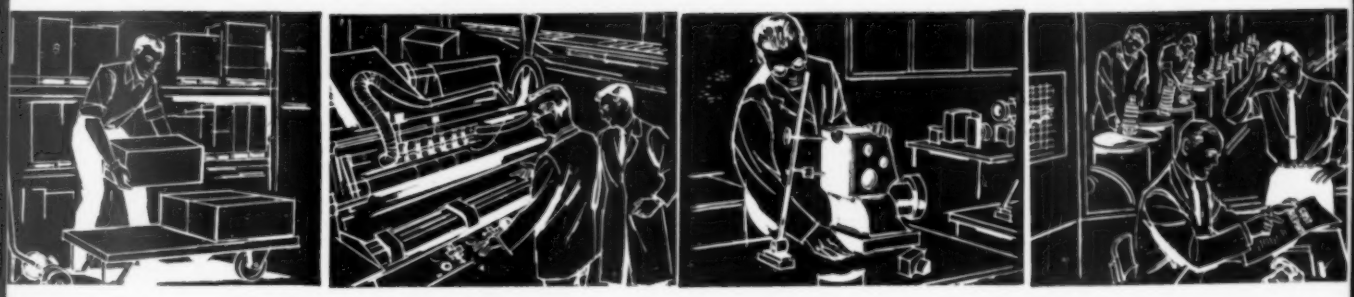


This manager is asking himself—how's my plant doing on (l to r) management practices, planning, handling, manufacturing engineering, quality and cost control. His answers (and yours) are found in this original research. It's . . .

FACTORY'S 1960 AUDIT GUIDE FOR MANUFACTURING

This manufacturing audit idea literally arrived in the morning mail. The letter, from a plant manager, was addressed to Senior Editor Robert S. Rice. It was in response to a tough 14-page questionnaire Bob had sent out to research six major manufacturing functions (drawings above). Bob directed the research and wrote this article.

Here's what the letter said: "This was the toughest questionnaire anyone has ever had the nerve to send us. It took many hours to complete. But now we really know what's going on in our plant. And we're anxious to see what others are doing so we can complete the audit we started by answering your questionnaire."



SO YOUR PLANT looks pretty good to you right now. Running smoothly. Making a profit. But is it good enough to compete in 1960—and the years ahead? Chances are, some things *need* improvement. Others, if improved, will strengthen your ability to compete in 1960. Where are your strong points? Your weak ones? In management practices? Quality control? Engineering? Or any of the other functions?

Plant conditions don't stand still. They change continuously. That's why FACTORY believes you can profit now—or any time—from a systematic audit of your plant's practices. And that's what you'll find here and in the following pages—an up-to-the-minute survey of manufacturing practices in 1959. You can use this survey to check your own situation today, compare it with others, and develop your own schedule of planned improvement for 1960.

Through such an audit you can . . .

- Find your production weaknesses.
- Face up to newer and better techniques that you may be able to use profitably.
- Stimulate your managers to improvements.
- Lay the foundation for long- and short-term improvement programs.

This audit guide is based on the experience of 162 plants

The table on your right lists the number of plants by size and type that contributed data to this survey. Although FACTORY used this industry classification in earlier surveys ("Electrical Management and Maintenance Practices Today," August 1958, and "Maintenance Management Practices Today," September 1958), the explanation bears repeating:

Heavy Process: Equipment is heavy process type. Cost of interruption is high. Examples: industrial chemicals, petroleum refining, pulp and paper, steel.

Light Process: Equipment is light process type, with moderate to high cost of interruption. Examples: foods, glass products, paints, cosmetics.

Heavy Fabrication: Equipment is heavy fabrication and assembly type. Cost of interruption is low to moderate. Examples: aircraft, machine tools, auto assembly, pressure vessels, storage batteries.

Light Fabrication: Equipment is light fabrication and assembly type, with low cost of interruption. Examples: paper products, footwear, plastic products, hand tools, small electric controls.

Benchwork: Equipment is very light benchwork type. Equipment cost of interruption is very low. Examples: military electronics, instruments, optical goods, electronic controls, business machines.

FACTORY's purpose in making this survey was to find out for its readers how plants are actually managed today. The following seven pages are crammed with information about management techniques and manufacturing methods and equipment.

You can use these data as a base for auditing your own plant. But remember: These are 1959 practices. Percentages were different in 1958. And a 1960 audit would show changes. So, even if your plant looks good by comparison with these data, you can't afford to be smug. Your competitor may be among those plants that will make these 1959 practices obsolete.

Who Answered The Survey?

TYPE OF PLANT		SIZE OF PLANT	
Heavy Processing	18	Up to 99	7
Light Processing	30	100 to 249	20
Heavy Fabrication	30	250 to 499	56
Light Fabrication	69	500 to 999	41
Bench Work	15	1000 and up	38
Total	162	Total	162

Turn the page

AVERAGE RATINGS OF IMPORTANCE OF COMMUNICATION METHODS WITHIN THE PLANT

. . . AUDIT YOUR PLANT MANAGEMENT PRACTICES

Personal contacts are the best way to lick the communications problem (chart). Committees (chart, right) solve cost-reduction problems on a face-to-face basis. Most plants say time spent in meetings is right—some even want to meet more.

What problems are troubling plant management today? We asked respondents to rate problems in relation to trouble they cause and time they take. On this basis it turns out that all problems seem to take more time than they're worth. Or perhaps this indicates that respondents think they could be more efficient in dealing with their problems.

The No. 1 problem is controlling costs. But it's followed pretty closely by others, including:

- Communications: Getting people to understand what's wanted and needed.
- Maintaining quality of product.
- Meeting production goals.
- Motivation: Getting people to do what they're supposed to do.
- Union relations and grievances (rating adjusted for percentage of plants with unions). This is rated only average in magnitude.

Lowest rated problems are development of management personnel and organization, including interdepartmental coordination and politics.

How many plants have a manufacturing management manual? Three-quarters of the big plants (1000 or more employees) have them; also half the medium-size and small plants. But 25% of the small plants that don't have manuals say they're planning to prepare them. Of the plants that have manuals, 90% include company policies, 82% include operating procedures. A little more than half the management personnel have a copy of the manual. But among the small plants only 55% have their manuals up to date. Of medium-size plants, 76% have them up to date, and of large plants, 92% are up to date.

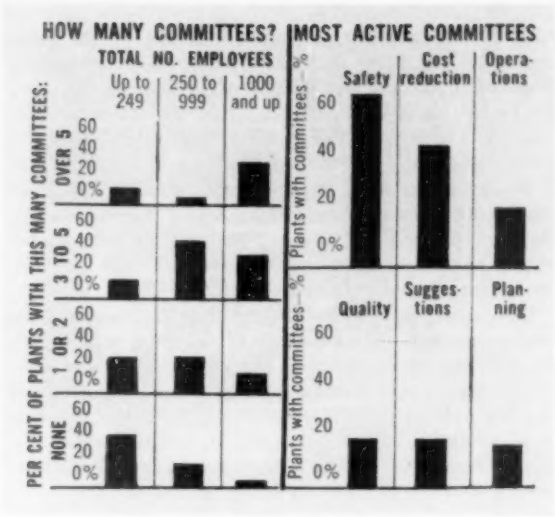
Too many meetings? We would have bet the answer would be an overwhelming "Yes." But we would have lost the bet. The feeling about meetings and conferences correlates pretty well with the size of the plant. Here's the run-down:

- Small plants: 8% say too much time is spent in meetings; 63% feel it's about right; 29% think they should spend even more time.
- Medium-size plants: 23% think they're spending too much time meeting; 64% believe the time is about right; only 13% want to increase it.
- Large plants: A big 47% say too much time; 53% think it's right; none say too little.

How much may managers spend? Generally, managers and supervisors are authorized to approve (without specific approval of a superior) higher expenditures for operating supplies and repair jobs than for capital expense items. But the differences aren't great. In the small and medium-size plants about 75% of the plant managers are limited to an expenditure of $2500; 75% of department heads have a maximum of $1000; and 75% of first-line supervisors have a maximum of $500. Taking the same 75% break-point for large plants, the amounts move up to as much as $10,000 for plant managers and $2500 for department heads. But first-line supervisors are held to the same $500 limit as in smaller plants.

How popular are consultants? Nearly half (45%) of the plants report they have used the services of outside consultants during the past year. Projects on which they worked covered just about every function in the plant. Most often mentioned were these:

- Manufacturing controls—work measurement and incentives; forms and procedures; production planning and control.
- Manufacturing processes—equipment and process design; material handling; production materials.



• Plant maintenance and engineering—construction and power plants.

• Others—employee relations; employee surveys; accounting; product engineering.

A substantial number of plants report they are not completely satisfied with results of the consultants' work. It's difficult to believe (as respondents reported) that as many as 23% of the jobs were poorly done (in the case of manufacturing controls). We suspect these answers largely reflect two conditions that can develop when a consultant works in a plant. In the first place, management employees are apt to be more critical of the consultant's work than they are of the work of their associates and subordinates in management. In the second place, middle and lower management may know a great deal less about the project concerned than top management does.

How many workers per supervisor? There are wide variations from plant to plant. Following are the maximum average numbers of workers per supervisor for about 75% of the plants in each industry type: heavy process, 25; light process, 40; heavy fabrication, 20; light fabrication, 30; benchwork, over 40. The averages are about the same in both production and non-production departments of all industry types except benchwork. In these plants 75% report they have a maximum of about 30 workers per supervisor in their non-production departments.

Where do you get supervisors? A great majority are promoted from the ranks: two-thirds in the case of benchwork plants and three-quarters in all other industry types. Other sources—college graduate trainees, transfers from staff departments, and hires from the outside—tend to contribute about equal proportions. Process industries appear to get twice as many supervisors from among college graduate trainees as other industry types get. Benchwork plants hire twice the percentage of supervisors from outside the company as do the other industries. Small plants, too, get many more supervisors by employing outsiders than do larger plants.

Small plants have the highest percentage of college graduates among their first-line supervisors—19%. Medium and large plants count 12% of college grads in their first line of supervision. Industry-wise, heavy process plant have 19% of college grads; benchwork plants, 17%; and all others, 12%.

Are skill needs rising? Yes. Mechanization (or automation) and tighter specifications are the main reasons. About 60% of the plants say mechanization raises skill levels; 31% believe it hasn't changed them; only 9% think it has lowered them. The same proportions apply to the effect of tighter specifications on skill requirements. About half of the plants see the need for higher skills with respect to instrumentation of processes. The other half see no change ahead. Two-thirds report that miniaturization of products does not affect skill requirements. One third find that miniaturization has made it necessary for them to find employees with higher skills.

Where do plants get the higher skills when needed? Three out of four employees placed on higher-skilled jobs are trained by the plants. Only one in four is hired from the outside. A hint: You may need to take a careful look at your training practices.

Are new mathematical problem-solving techniques used? A surprisingly significant 19% of the plants report using operations research. This is the war-born technique of developing mathematical formulas to improve routine decisions in areas such as production scheduling, distribution, and plant layout. (The 19% remained after we omitted many plants that said they're using operations research. Their projects indicated they thought we meant traditional applied research in products and processes.)

Plants are using operations research techniques on a large variety of problems. They include: inventory control, production scheduling, warehouse operations, materials and product flow, machinery life and replacement, material handling, machine utilization, and paperwork flow. Benchwork and heavy processing industries are above the average in use of O.R.; light fabrication is average; light processing and heavy fabrication industries are the lightest users.

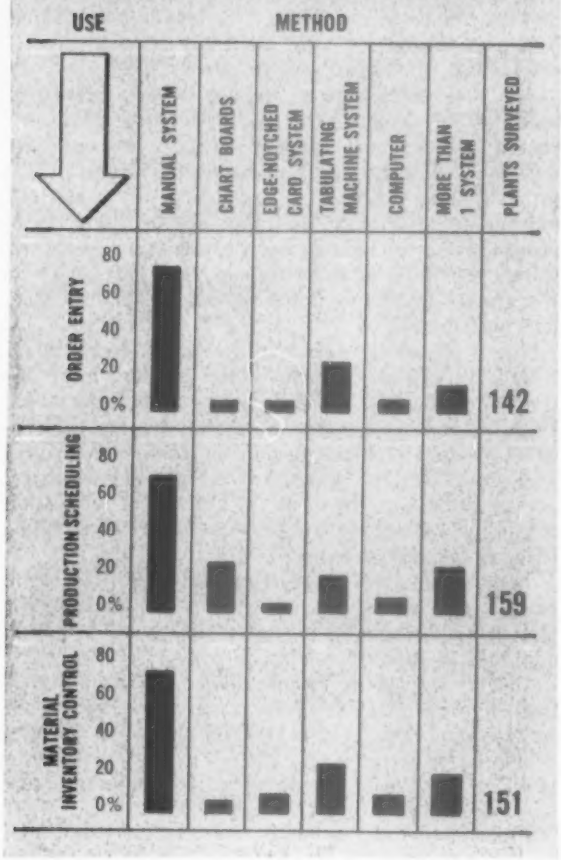
Large plants are more frequent users than small plants. But, surprisingly, 10% of the plants numbering less than 250 employees are using this sophisticated approach to problem solving.

Linear programing and simulation studies are used less—by 14% and 5% of the plants, respectively. But we're certain these percentages will climb—as will that of operations research as a whole—during the next few years, as more plant people learn these techniques and gain experience in practical application.

Make-or-buy studies and value analysis studies of products and components are popular. Nearly half—48%—of the plants use make-or-buy studies to compare advantages of making and of buying the components of its products. A lesser number—36%—use the value analysis technique to challenge the costs of materials and parts built into their products. All industries use both techniques about equally. Use is not restricted, as some think, to plants making fabricated and assembled products. The larger plants are more frequent users, but not the exclusive users. Many small plants are also using these aids, apparently with satisfaction and benefit.

Turn the page

PRODUCTION AND MATERIAL CONTROL SYSTEMS



. . . PRODUCTION AND INVENTORY CONTROL

Manual systems schedule the plants (chart)—but mechanization is growing.

Planning tools (forecasts and production data) are inadequate for their jobs.

Control costs average 3.5% of total.

ALL PLANTS doubtless agree that one of the more important functions in plant operation is controlling input of materials and output of products. But they don't agree on how to organize to get the job done. For example, 53% of heavy fabricating plants combine production and inventory control in one department; 47% divide the two. At the other extreme, 87% of benchwork plants combine them under one supervisor. Over-all, 66% of the plants have both in one department. The small plants are highest, with 81% combining inventory and production control.

How many people are needed in production and inventory control? About 3% of total employment. That's the average of all plants. Heavy process plants are low (2.2%), heavy fabricating (3.8%) and small plants (4.1%) are high. About 24% of the plants use the time of some production employees for expediting and dispatching. Again, heavy fabricating plants are above average (36%). And fewer heavy process plants (12%) use extra people. But the small plants are low in this practice. Only 14% of plants under 250 employees use expediters and dispatchers in addition to employees in production and inventory control. This tends to offset their higher percentage of office employees.

How good are the planning tools? Not good enough. Nearly 40% of the plants think available tools—sales forecasts, past production data, past sales data—are less than 75% reliable for planning of production levels. Only 11% find sales forecasts as much as 90% accurate. More, 26% and 21% respectively, find past production and sales data at least 90% reliable.

How fast is inventory turnover? The answer depends on industry and type of inventory. Process industries turn over purchased materials about 14 times annually, heavy fabrication and benchwork plants about 12 times, light fabrication plants only 8 times.

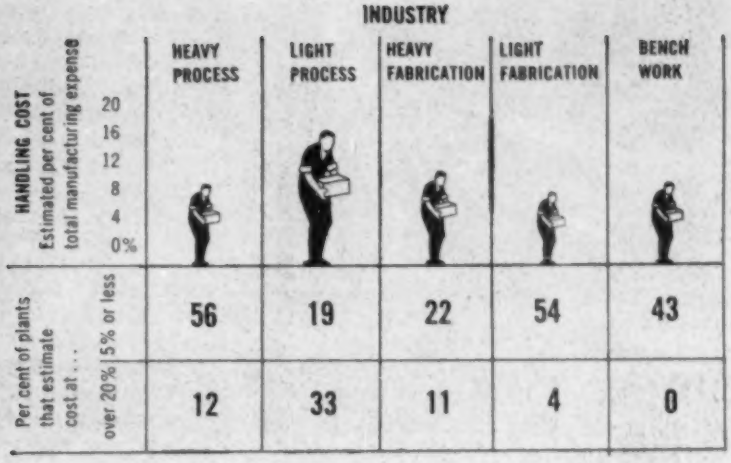
Work-in-process inventories turn over 25 times annually in the process industries, but only 14 times in fabrication and benchwork plants. Finished goods inventories follow a distinctly different pattern. Heavy process plants turn over their product inventories 21 times a year, light process 15 times, heavy fabrication 14 times, light fabrication 11 times, and benchwork plants only 8 times annually.

Turnover of operating supplies inventories shows surprising differences. Benchwork plants lead with a turnover rate of 14 times a year, process industries report a rate of 11, and fabrication plants turn over operating supplies only 8 times.

Are inventories moving faster or slower than they did three years ago? Most plants report turnover rates of all inventories are about the same. That's particularly true in the case of supplies and spare parts. But higher percentages of plants say they now have higher turnover rates for inventories of materials and finished goods than they did three years ago.

What is the cost of production and inventory control? Estimates of cost range from less than 1% up to 20% of total manufacturing expense. (One strangely high figure was omitted from the final tabulation.) Processing industries average 1.9%. Fabrication and benchwork plants estimate the average cost at 3.9%, about double that of processing plants. Small plants estimate their cost at 4.0%, while the two classifications of larger plants average 3.2%.

COST OF MATERIAL HANDLING



. . . AUDIT YOUR MATERIAL HANDLING

Handling costs average about half the usual estimates of 20% to 25% (chart). Organization shows no pattern, reveals the octopus-like character of handling. Mechanization belts along at rapid rate—it's the track to lower handling costs.

LOOK CAREFULLY at the cost estimates in the table above. We believe they are considered and reasonable estimates of handling costs. They reflect the cost of wages paid handlers. But the estimates are much lower than those generally conceded to be correct (20% or more). Apparently, the hidden costs of handling are very high. There's a real challenge here for those who want to cut costs.

How is material handling organized? In general, it isn't. Our questionnaire asked the management organization of seven categories of material handling—receiving, shipping, in-plant handling, raw material storage, product storage, packaging, and traffic. In 20% of the plants one manager is in charge of six or seven kinds of handling. Usually, however, plants divide these jobs among several supervisors.

Following are seven handling jobs. The percentage after each one is the per cent of plants where one manager is responsible for that job, plus one or two others: receiving, 64%; shipping, 58%; in-plant handling, 68%; raw material storage, 64%; product storage, 54%; packaging, 61%; traffic, 53%. In 31% of the plants, in-plant handling is the responsibility of production supervisors. Packaging responsibility is assigned to production by 33% of the plants.

How many employees work full time handling materials? Variations among plants are wide. In one industry and plant-size group the percentage of employees working full time on handling jobs ranges from less than 4% to more than 25%. But most plants fall within a bracket of 3% to 10%. Industry averages are: heavy processing, 9%; light processing, 8%; heavy fabrication, 7%; light fabrication, 5%; benchwork, 3%.

Who engineers material-handling methods? Over-all industrial engineering has primary responsibility for designing handling methods in 46% of the plants, secondary responsibility in 30%. Plant engineering actually does the work in 42% of the plants, has a secondary responsibility in 25%. Line supervision is the prime doer in 38% of the plants, gets involved in 48%. Only 15% of the plants delegate primary responsibility to a material-handling department, and 17% give secondary responsibility. In the small plants (under 250 employees), with fewer staff employees, line supervision most often has the job. Percentages of plants assigning this work to staff engineers increase in relation to increasing plant size.

The percentages for both primary and secondary responsibilities add up to more than 100%. Many plants divide even primary responsibility between line and staff. Developing a new or improved handling method is a team job.

Is handling equipment important? Yes—and getting more important, too. All plants say they'll need more handling equipment, of one or more types, in the next two years. Most plants report they intend to get more than one type. Kinds of equipment used by most plants include fixed and portable conveyors, powered and non-powered lift trucks, pallets and skids, storage racks, tote boxes, hoists, and elevators. Types of equipment most often mentioned in plans for the short-term future include all those above, plus bulk material conveyors, jib cranes, positioners, and pipelines.

The cost estimates in this survey seem conservative. Even so, the cost of material handling is admittedly high. Mechanization with handling equipment has big payoff opportunities. Most plants indicate this is true. Furthermore, they're planning to try to get these savings in every way they can.

Turn the page

PLANT EXPERIENCE WITH MODERN PROCESSES

ADVANCED PRODUCTS AND PROCESSES	Per cent of all plants (162) Using now	Per cent of plants using now that: Were using 3 years ago	Are satisfied with application	Expect to increase use
Central instrument panel control	19	70	97	89
Micro-filming mgmt. records	19	77	97	58
High-tensile strength adhesives	16	44	88	91
Plastic tooling	15	58	79	65
Optical tooling	14	50	95	60
Ultrasonics for cleaning	14	9	87	75
Ultrasonics for processing	5	25	88	86
Ceramic tooling	10	38	80	81
Numerical control	9	43	100	83
Powder metallurgy	9	50	77	54
Automatic weighing	8	46	92	69
Radioistotopes	8	69	92	58
Shell molding	7	42	75	70
Telemetering	5	50	100	50
Closed-circuit TV	4	57	100	43
Automatic order-picking	1	0	100	100

. . . AUDIT MANUFACTURING ENGINEERING

Few plants use the modern techniques above—but the "takers" are sold on them.

Manufacturing labs have sprouted quietly but abundantly—almost overnight.

Picture taking speeds data gathering.

What organization for engineering? FACTORY's questionnaire shows that when you ask this one you can expect a wide variety of answers.

In the design and selection of processing equipment and methods, 42% of the plants separate responsibility for equipment from responsibility for methods. Apparently, 58% believe it's advantageous to have both functions in one department. Same is true of tool design and maintenance, except that even more plants—57%—separate these related functions.

One plant reports it has a separate plant layout department. Others give this work to industrial engineering (40%), line supervisors (24%), plant engineering (16%), and others. Safety is usually assigned to personnel (35%) or to industrial relations (14%). Line does the job in 20% of the plants. Safety departments (8%) and safety committees (6%) account for most of the remainder.

Design or selection of product packaging shows up in more different departments than any other function. The department that gets it most often is industrial engineering—27%. It's followed by sales, 18%; engineering, 12%; production, 9%; purchasing, 5%; and 4% each for packaging, shipping, and product design.

Personnel and industrial relations usually run suggestion systems. They account for 53% of the plants. Industrial engineering handles the program in 18% of the plants; committees in 13%; linemen in 12%.

Work simplification and work measurement are firmly established industrial engineering responsibilities (64% and 75%, respectively). The line does this work in almost all the remaining plants. But accounting handles work measurement in 3%.

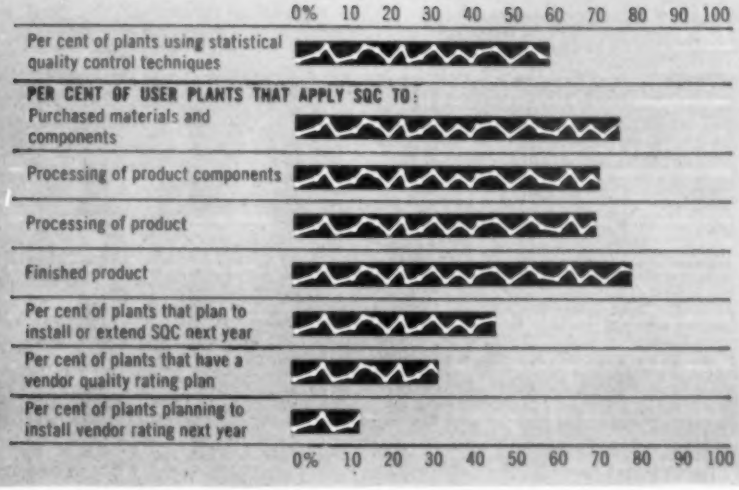
How popular are manufacturing labs? A surprising fact: 34% of the plants say they have "a laboratory exclusively for research in production processes, methods, or materials." And it's pretty consistent from one industry type to another. The large-plants group is high—53%, and the medium-size plants are low—27%. If you don't have such a lab, you may be overlooking something.

Is a camera used in manufacturing? Yes, in four out of 10 plants. Among large plants it's 57%; small plants, 27%. Most industries are represented significantly except wood products, furniture, and instruments. For ways to make good use of a camera (still or movie), here's a list, arranged in descending order of number of mentions: to record and study methods, equipment, and layout; to record operating information and conditions; to record product designs and specifications, especially odd ones; to train personnel; to record conditions of packing and shipping; to record product inspection; to spruce up housekeeping; to improve safety; to keep inventory records.

What's new in work sampling? It's spreading like wildfire, though almost a new technique. Of the plants surveyed, 47% say they're using it. Again the large plants lead with 67%. Small plants are low with 27%. Benchwork plants are high with 85%; light processing plants are low with only 20%.

How are these plants using work sampling? Here is a list of uses, starting with those used by the greatest number of plants: employee workloads, equipment utilization, performance analysis, downtime, quality control, time-study allowances, work measurement.

HOW AND WHERE PLANTS USE STATISTICAL QUALITY CONTROL


0% 10 20 30 40 50 60 70 80 90 100
Per cent of plants using statistical quality control techniques
PER CENT OF USER PLANTS THAT APPLY SQC TO:
Purchased materials and components
Processing of product components
Processing of product
Finished product
Per cent of plants that plan to install or extend SQC next year
Per cent of plants that have a vendor quality rating plan
Per cent of plants planning to install vendor rating next year
0% 10 20 30 40 50 60 70 80 90 100

. . . AUDIT YOUR QUALITY CONTROL

Statistical quality control is now used in more than half the plants surveyed. Inspection is more complex. New equipment and techniques are catching on. More college grads are needed in quality control jobs—even more in the future.

QUALITY requirements continue to get tighter. More equipment is needed. There's considerable progress in mechanization (or automation) of inspection and testing. And, of course, the use of statistical techniques in quality control is expanding rapidly.

Is one manager responsible for all quality control activity? There have been many debates on the merit of separating quality control from routine inspection and testing. But 70% of the plants combine everything related to quality under one manager. Processing plants tend to divide responsibility more than others. Only 58% of these plants have one manager for both, in contrast with fabricating and benchwork plants, 76% of which combine the responsibilities. There's little difference with regard to plant size although larger plants more often combine the work.

What techniques are used? Nearly all plants use more than one technique. The average (out of a list of five major techniques) is 3.4 per plant. Physical inspection is most widely used in 98% of fabricating and benchwork plants and in 88% of processing plants. Statistical quality control shows up in 54% of the plants, about the same in all industry categories. Processing plants use laboratory analysis more than other plants—86% to 61%. Non-destructive and destructive testing are used by 63% and 56% of the plants respectively. Non-destructive testing has developed fast, moving in on all types of products.

How many employees are needed to protect quality? Heavy processing plants employ the highest percentage (6.6% of total employees). Heavy fabrication is low with 3.2% of all employees in quality jobs. The other three classifications—light processing, light fabrication, and benchwork—average 4.7%.

In addition, however, half the plants utilize employees on the production payroll for inspection and testing, and 21% of the plants have production people doing statistical quality control work.

Of all employees in quality-related work in processing plants, 27% are college grads. In fabrication and benchwork the figure is 16%.

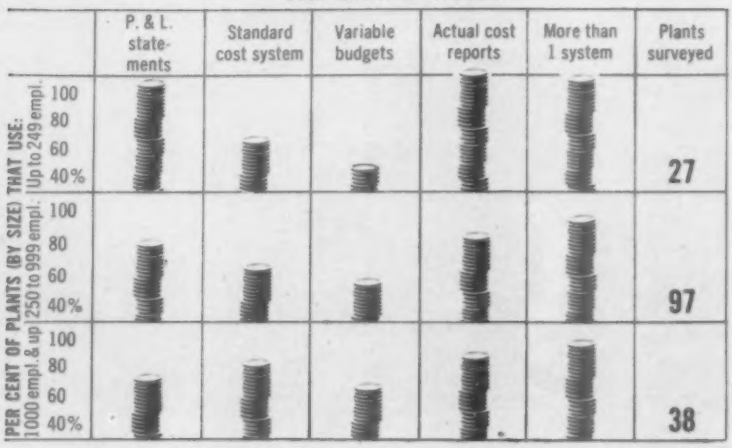
What does quality control cost? Light processing plants report the highest cost—5.9% of total manufacturing expense. Heavy fabrication and benchwork plants come next—tied at 4.8%. Heavy processing and light fabrication are low with estimates of 3.7% and 3.5% respectively.

How much product is 100%-inspected? Averages may be deceiving in answering this question because plants are forced to do piece inspection on some products. Yet the averages are revealing. As you might expect, benchwork plants are highest in per cent of product inspected; 50% of them inspect over 90% of their output. But 47% of processing plants report they inspect over 90% of their products. Only 24% of fabricating plants inspect over 90% of the output. In all three groups, close to 40% of the plants inspect less than 10%. Differences in practice between small and large plants are not significant.

Are plants using newest equipment for inspection and test? Not as much as you might think. Optical comparators lead the list, used in 39% of the plants. Air gages are next, used by 30%. Other types of equipment and percentages of plants using them include: automatic process controls, 21%; radiography, 18%; spectrometry, 12%; electronic leak detectors, 11%; electron-microscope and radiation gages, 6% each. Over-all, growth in use of these types of equipment has been 26% during the past three years.

Turn the page

METHODS OF COST CONTROL USED IN TODAY'S PLANTS



. . . AUDIT YOUR COST CONTROL

Cost control methods need overhauling (chart)—plants say it's a top problem.

Regular cost reports are not enough—there's more use of day-to-day cost facts.

Many plants report no productivity improvement—rest gain a competitive edge.

EVERYBODY talks about the weather. Same for controlling costs in the plant. What people do about either one meets with varying degrees of success. Truth is, the system used to control costs probably isn't so important as the will to control costs—the attitude toward the job. But a good system helps. Here are the details of what plants are doing to keep costs down:

Who sets cost goals? There's an almost perfect three-way split among the plants on the question of who sets the standards and budgets for cost control. Finance received a small plurality but it's closely followed by production, then by joint responsibility of the two. Staff does the job for manufacturing in 57% of the plants. Line executives set the bogies in 34%, and top management does it personally in the remaining 9% (nearly all small plants).

Approval of the standards is reserved for manufacturing management, rather than finance, with more than a 2-to-1 edge.

The trend is toward better standards. Over-all, two-thirds of the plants use engineered standards or a combination of engineered and historical data standards. Only one-third (mostly small plants) use past costs alone for a cost target. Only half of the small plants have engineered cost standards. And 10% of small plants have no standards at all to aid them in setting cost targets.

How often are costs reported? Monthly reporting is the general pattern in plants of all sizes. Three-quarters use this frequency. Weekly reports are issued by 22% of the plants. But some plants (9%) put out additional cost reports at other time intervals—daily, quarterly, at job completion, etc.—to supplement regular reports. Only 3% of the plants (none among the small ones) issue some cost data daily.

Who gets cost reports? Management people on the shop floor. That's the general rule. Regardless of size, 70% of the plants give first-line supervisors cost information. Only 20% of these supervisors get full reports, but all get enough to gage performance in their departments.

"Control the causes of costs and you control costs" is a pretty accurate, if obvious, axiom. Many plants collect and distribute special reports on significant cost elements. Here are the elements most often mentioned in the survey, and their frequency:

Overtime hours, weekly; direct labor hours, weekly; indirect labor hours, weekly; material usage, monthly; production volume, daily; maintenance charges, monthly; material losses, monthly.

Daily reports on the three labor elements (direct, indirect, and overtime) and material losses are not unusual. Plants distributing these data daily number about one-third of those who report such information weekly or monthly.

What do plants use to stimulate cost reduction? A surprising 29% have incentives for management, averaging 13% extra pay. And 43% have organized work simplification programs; 41% have suggestion systems. Benchwork and larger plants are above average. Light processing and small plants are on the low side.

What results? In the past year productivity went up in only two-thirds of the plants, according to survey answers. More than a quarter think it remained even, and 6% say output per man-hour went down. Answers are about proportionate for each industry group although a higher percentage of heavy fabricating plants believe productivity rose. Small and large plant answers are on the low side of the average; medium-size plants are above.

Big Company V. P. Takes Aim at 1960 Costs

In this exclusive interview Donald C. Burnham, manufacturing V. P., tells how giant Westinghouse will cut plant costs in post-recession year.

Westinghouse Electric Corporation today is one of the most dynamic companies in a super-competitive industry. One of the men responsible for that dynamism, lanky, reserved Don Burnham, tells here of the Westinghouse approach to problems plaguing all manufacturing industries.

ON INVESTMENT PAYOFF

"A cost reduction project is more than worth while if it returns 20% on the investment."

Since cost reduction payoffs include an evaluation of increased output, Westinghouse finds that there is nothing about the viewpoint of "by-product added capacity" to interfere with its traditional way of evaluating a capital expenditure request. While the company carefully details its investment proposal analyses, the 20% rule of thumb provides a quick guide for an OK or a turndown.

ON ADDING NEW PLANTS

"Our emphasis in 1960 and for several years to come will be on getting the very most use out of our existing facilities."

Says Burnham, "The sum total of our manufacturing planning and cost reduction activities is that it has reduced the need for new plants. We could

"The result of our manufacturing planning and cost-cutting activities is a reduced need for new plants."

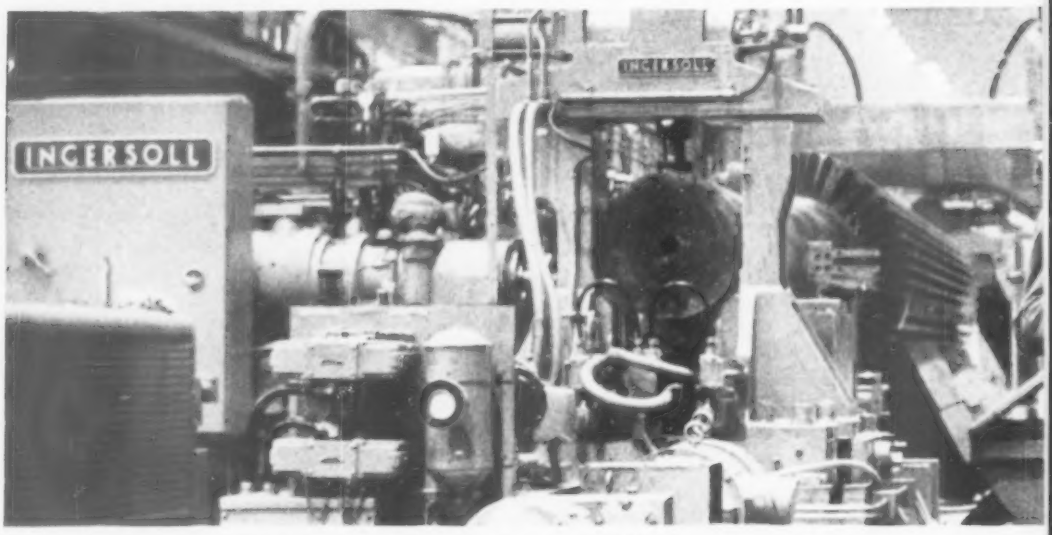


Photo locale: Westinghouse heavy equipment plants, East Pittsburgh, Pa.

Burnham's view (and that of his staff) is that there is no

show you a couple that went through the planning stages only to be tabled when we found we didn't need them. FACTORY did an article a couple of years ago on our Vicksburg, Miss., plant. It showed how a methods-improvement plan was carried out in a brand-new facility. Well, right now at Vicksburg the plant is capable of 50% more output in the same floor space it had when originally built in 1954. This was one of the experiences that led us to re-examine our new-building program."

ON PLANNING NEW FACILITIES

"We find ourselves planning our new plants tighter than ever before."

Five or six years ago Westinghouse used to plan a new plant with the estimate that its capacity would not be fully utilized for five years. "Now we plan a new plant to utilize its full capacity the first year," says Burnham. "The additional capacity we hope we'll need will come from a continuing program of facilities improvement. This program must begin, and does at Westinghouse, the day the new plant goes into operation."

ON PLANT CAPACITY

"Through replanning of existing plants and normal cost reduction activities in the last two years, we have improved our plant capacity beyond any of our projections."

To put a figure on it, and it is an amazing statistic even for a company as large as Westinghouse, the manufacturing planning in the last two years has resulted in increased plant capacities that would otherwise have required a $50-million investment in new plants.

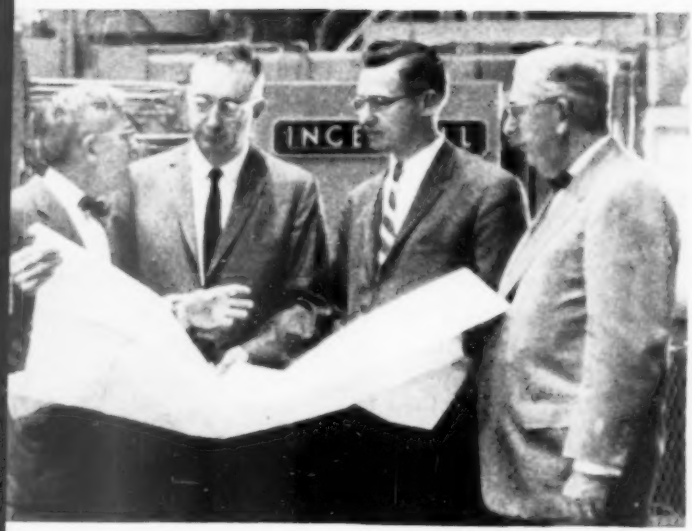
Burnham describes this concurrent increase in capacity as a conclusion that ought to be obvious, but often isn't. "Take, for instance, a tape-controlled Milwaukee-Matic," says Burnham. "We bought one to replace five existing machines. Our objective was a simple one—to reduce costs. But what's the net effect? Added plant capacity in less floor space. First of all, the automatic machine doesn't take up the same floor space as the five machines it bumped out. But, in addition, the automatic doesn't require space to store materials between operations as the five machines did. Nor does it need the aisle access and operating space the five machines required.

ON COST REDUCTION

"The secret of this kind of cost reduction lies in focusing on bottlenecks."

Burnham's view (and that of his staff) is that there isn't an operation anywhere that can't be improved. But Burnham warns that while increased plant capacity may be a by-product that was not planned, reduced costs almost never are. "You have to plan actively," he says. "You must set solid targets and assign responsibilities firmly if you expect to achieve worthwhile results."

Westinghouse puts this responsibility squarely



operation that can't be improved.

"The better and more active the manufacturing group, the greater the cost reduction and productivity."

in the hands of manufacturing planning groups at headquarters and at each of the manufacturing facilities. In each location this group of well-trained, high-caliber engineers has the responsibility "for continually improving manufacturing methods, equipment, and facilities." Burnham asserts, "The better (and more active) the manufacturing group, the greater the cost reduction—and the greater the added productive capacity."

ON PRODUCTION FORECASTS

"As a base for forecasting the capability of a given plant to meet projected sales requirements, there is a dangerous tendency to rely too heavily on past performance."

"Accurate plant capacity data are hard to come by," says Burnham. "It's unrealistic to take name plate specifications at their face value. And historic data cover up a multitude of operating difficulties. This is often a reason why added capacity escapes your notice.

"Take a concrete example of how a forecast based upon past performance could mislead you—cost your company untold dollars in unnecessary construction and you a very red face.

"Suppose a plant (and this example is very close to the facts) estimates its top capacity (dollars of output) to be $10-million a year. Its sales department now projects its marketing pattern for five years: a straight-line increment from its current base of $7-million at the rate of $10-million in three years; and $12-million in five.

"Traditionally, we would begin to think right away in terms of planning a new plant to be ready to handle the additional sales demand in three years. Roughly, we would set aside one year to plan the new facility, a second year to build it, and a third year to get it up to capacity. This has turned out to be bad arithmetic.

"What we have found happening is that by the time the new plant could be built and be on the way up to its forecast capacity, the older plant could have had its capacity increased through new methods and revised layout, so that it could have taken care of the need without help from a new plant. Time and again we have found this happening in the last few years.

ON OBSOLESCENCE

"Big plant or small plant, the biggest mistake a management can make is to assume that because its equipment, methods, and services are up to date today, they will remain that way."

This viewpoint is a way of life for Burnham and his associates. And it protects them from the assumption that continual cost reduction will always add enough capacity. "In some cases," says Burnham, "product demands go right through the roof. If you're caught napping, even the new plant *plus* the old plant won't give your sales department the production it wants. Often obsolescence of a facility is brought about by changes in a product rather than by changes in unit capacity."

Turn the page

"Management can take the most evident cost savings first—no need to evaluate fringe projects."

"We consider automatic testing just another manufacturing operation to be integrated into our processing lines."

"We don't see a very early, rosy future for automation in assembly."

ON MACHINE UTILIZATION

"We plan most of our manufacturing facilities for two-shift operation. This seems to be the most economical way to make proper use of the investment in machinery."

Westinghouse, with few exceptions, has standardized its manufacturing operations on a two-shift basis. Says Burnham, "Our rule of thumb is that we'd always go to a second shift before we'd put up a new building." A sales emergency? "We've rarely found a marketing situation where there wasn't a big enough cushion to handle it by swinging over to a third shift or using overtime."

ON ECONOMIC STUDIES

"It seems patently obvious that when a machine costs a half-million dollars, to run it on a second shift is a necessity, and on a third shift a pretty good gamble."

When asked if Westinghouse makes economic studies to determine when a third shift is desirable, Burnham replied, "Not as a routine practice." While agreeing that the economics of third-shift operation are frequently a matter of speculation, his opinion is that plant management can take advantage of the most evident cost savings without investing a great amount of time and money to evaluate marginal projects. He cites the example of a big milling machine purchased by an apparatus division. "It cost over $1-million. It just *has* to be run on a third shift to make it pay off."

"On the other hand," says Burnham, "there's little point in running a bench operation on a third shift. Benches don't cost much money." Doesn't this ignore overhead for the building itself? "Not so much as you might think. Housing costs for a bench operation might not be more than the night-shift pay premium."

ON AUTOMATIC TESTING

"One of the most rewarding areas for us in applying automation in the last year has been in simple test operations."

"The problems of automation are not in sending the signal," says Burnham. "The real difficulty is in performing the motions involved. This makes automation a natural for the kind of testing we have to do with electrical equipment, since it involves little mechanical motion. I could tick off at least nine examples where our plants have devised an automatic test set-up in the last year. Probably the most ingenious is at our Athens, Ga., plant where distribution transformers are automatically inspected after final assembly. Nine standard commercial tests are done automatically from punched cards—a card for each transformer. Results are evaluated and recorded, transformers accepted or rejected on the basis of the test.

"We consider testing as just another manufacturing operation to be performed, and we try to integrate it into our processing lines. I don't know why other companies in other industries can't apply the same principle. Wherever people have to read

"There's much talk about reliability in missile manufacturing. We're feeling the same pressure for reliability in household appliances."

dials or think through a sequence, this lends itself to automation. There are hundreds of production test situations where all an operator ought to do is to put the product on the test block, connect it up, and then push a button."

ON AUTOMATIC ASSEMBLY

"The idea of a 'standard hand No. 2' that you can put in your line to assemble part A to part B is a long way off."

"We don't see a very early or rosy future for automation in assembly," says Burnham. "Automatic assembly is still very highly specialized. Look at the automobile industry where so much assembly is still done by hand or partly by hand. Only where the labor content of the job is enormously high will investment in specially designed equipment be warranted. A good example of this is in the assembly of electric light bulbs. The equipment is just about as specialized as it can get. For instance, on a typical machine you can make a 100-watt lamp, but nothing else.

ON WAGE INCENTIVES

"We are installing measured day work without wage incentives at all our new locations."

When asked to compare this with the trend toward continuing wage incentives by most plants (FACTORY, April 1959), Burnham replied, "We believe that measured day work is a better way to plan and control production. For years few people have disagreed with the view that the real increase in productivity comes from a change in methods—not from people working harder. Incentives simply try to encourage people to work harder. We think it is the responsibility of our supervision to get a fair day's work from our people.

"Look at it this way. An incentive system tends to keep people working 10 years from now at the standards set today. People resist change when they're enjoying a good make-out. Consequently, with incentives the industrial engineer spends most of his time fussing about standards. Under measured day work a change in methods rarely affects pay. Measured day work cuts down this resistance to change in methods because the change doesn't affect a man's pay. And what's more important, it enables the industrial engineer to spend his time devising new and better methods.

"Incentive plans too often become just a crutch to foremen, in my opinion."

ON INDIRECT LABOR

"We're going to try to curb the trend to more and more indirect labor in the employee mix."

Westinghouse watches this trend carefully. It keeps master-control reports on three kinds of employees—direct production, indirect wage-roll (or blue-collar) employees, and salaried (or white-collar) indirect people, including line and staff management people. "We find, as do most other companies," says Burnham, "that as our employment rises, the total number of direct production employees remains almost static. But we have added other employees at an increasing rate.

How will Westinghouse curb this trend? "We are extending our application of data-processing equipment not only in the office but also in the tabulation and analysis of production and engineering data. Much is being accomplished, too, by reviewing and consolidating staff assignments. A study of the organization and effectiveness of our maintenance force is also underway."

ON TARGETS FOR 1960

Burnham assured FACTORY editors that Westinghouse in 1960 would continue to emphasize programs for reducing direct-labor costs and reducing manufacturing materials costs. But he said new focus would be directed toward "expense" items—especially that which Westinghouse calls "managed costs." This means that serious efforts will be made to examine and control the costs of maintenance, supervision, staff services.

Burnham also said that Westinghouse would emphasize procedures for attaining better quality control. "You hear a lot of talk about reliability in missile manufacturing," he said. "We're starting to feel the same pressure for reliability in things as mundane as household appliances."

Finally, Burnham predicted that the management of manufacturing will grow ever more complex. And as it does, it will demand greater cooperation among all the men who run the plants.

It's called EMFS diagraming for short

Like watching a magician from backstage, it takes the mystery out of electrical schematics.

Electrical-Mechanical Function Sequence diagrams enable you to get right to the heart of equipment trouble once you spot the malfunction in the mechanical cycle. And it saves you valuable time trying to determine the correct state of each electrical component at each point in the cycle.

This new weapon for plant trouble shooters is being used successfully at General Motors. Enough sell you say? Well then . . .

Best way to see for yourself how a typical EMFS diagram works is to trace out the operating sequence. Take a vane loading machine, for example, like the one in the photo. Pushbutton (PB) at bottom starts operation, sends signal to Control Relay 2 (2 CR). (Subscript 7, next to relay symbol, identifies the line on the schematic diagram on which the component can be found. Line numbers at the far right of schematic show lines where related components will be found.) Control Relay 2 then actuates 3 CR, which energizes Solenoid 2. At this point Machine Motion 1 (triangle) takes place and continues until Limit Switch 1 (1 LS) is tripped.

When 1 LS is actuated, 4 CR energizes Solenoid 3. At the same time the forward motion of the clamp cylinder stops and remains on dwell while Motions 2 through 5 take place, as represented by the horizontal line and the dwell symbol above the clamp cylinder.

A signal to Solenoid 3 starts Motion 2 (horizontal movement of index cylinder) and keeps it going until 2 LS is tripped. Index cylinder then dwells in forward position. Simultaneously 5 CR actuates Solenoid 4, starting Motion 3 (downward movement of stripper cylinder). When 4 LS is tripped, the cylinder dwells in a lowered position. At the same time 4 CR is released, in turn releasing Solenoid 3 and starting Motion 4 (return of index cylinder). When the index cylinder ram trips 3 LS, Control Relay 5 is dropped out, de-energizing Solenoid 4 and starting Motion 5 (return of stripper cylinder). At the end of the stroke, 5 LS is tripped. The cycle of Motions 2 through 5 begins all over again when 5 LS re-energizes 4 CR.

Thus far you've traced the mainstream of operating sequence. But the EMFS diagram does more: It shows all the significant interconnections in machine operation. For instance, 4 CR won't operate unless both 1 LS and 5 LS have been tripped and 6 CR released. You can find the same information on lines 12, 13, 14, and 22 of the schematic, but it takes time, and more than a little ingenuity.

The "floating" component location principle of EMFS diagraming allows as much detail as you think you will need. For its own use, GM draws a silhouette of each hydraulic cylinder and its associated limit switches and solenoids. Some components are hard to represent as silhouettes, so a few words are placed in the EMFS diagram at a logical point to explain what happens. The system retains much of the freedom of an instruction book, and the designer has to illustrate only those components and motions significant to basic machine operation.

Now let's see how the EMFS diagram speeds trouble shooting. You're the maintenance man called in to repair a vane loader which has stalled half way through a vane loading operation. A look tells you that the index cylinder has returned for the next operation but the stripper cylinder remains down.

A look at the EMFS diagram shows that the trouble lies somewhere between Motions 4 and 5. You check 3 LS visually to see that

A NEW WEAPON FOR PLANT TROUBLE

Every time John E. Craig (Process Development Staff, General Motors Technical Center, Detroit) had to answer a distress call from a division plant trouble shooter, it meant travel—a lot of it.

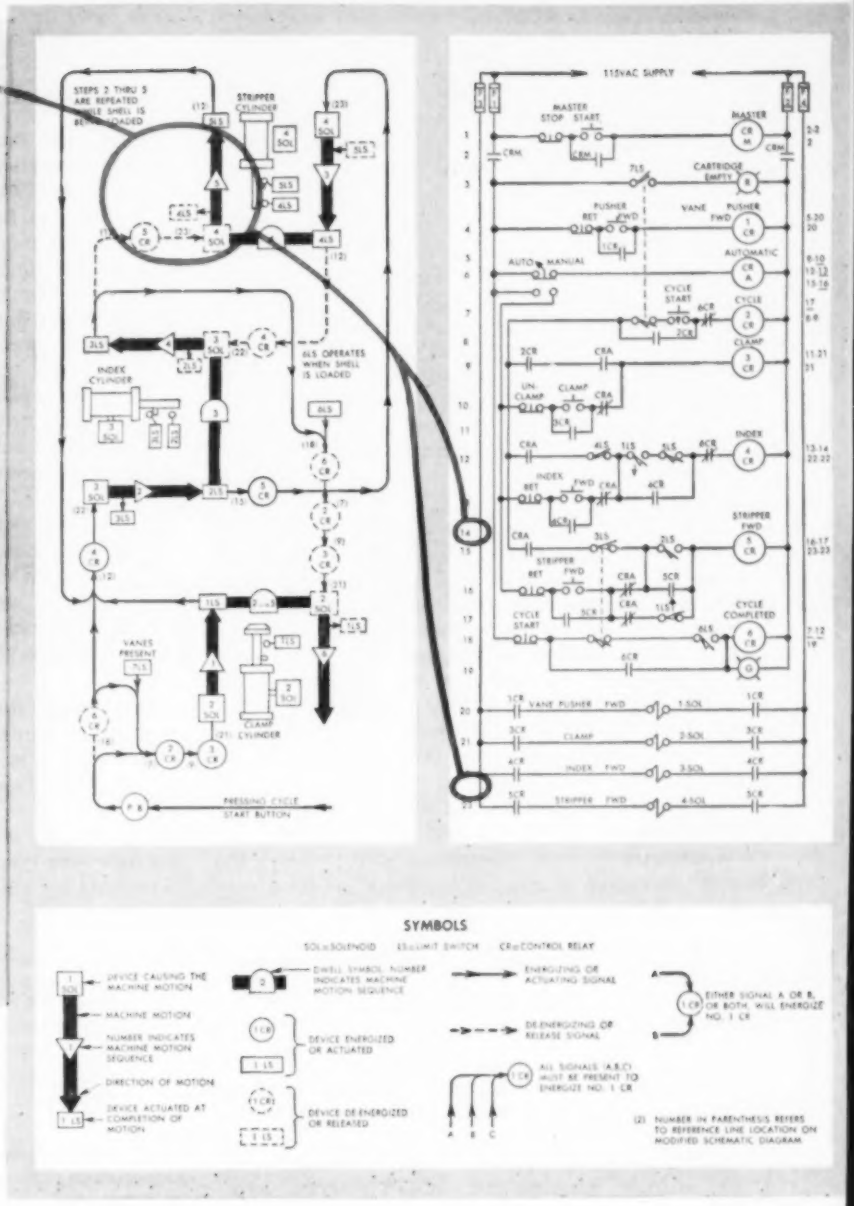
Craig's PD staff designs and builds special-purpose machine tools for some GM plants and is responsible for the machines' performance. So the costly travel situation was created every time a local plant maintenance staff was unable to diagnose a tough control circuit malfunction.

It was this dilemma that led Craig to develop the new way of diagraming electrical and mechanical functions of machine tools you see at right, above. This new system shows these functions in a way that's easy to understand. It's almost pictorial, in fact.

An EMFS diagram draws a bead on about 75% of the time of machine-tool maintenance men. It's the time they spend in work for which you get no return—learning how a machine should operate and spotting the specific trouble. This is the real fat in machine-tool control maintenance. The remaining 25% of machine-maintenance time—the time in which the repair is actually made—is a slim target by comparison.

Here's what EMFS does for GM:

- Cuts trouble-shooting time.
- Requires less interpretive skill in trouble shooters.
- Eliminates need for preliminary study of individual machine by trouble shooters.
- Adapts to existing as well as new machines.
- Aids machine designer during design stages.



the arm has moved to the tripped position (it has). Thus 5 CR and Solenoid 4 should also be released. No use looking anywhere else for now except in those three components and related circuitry.

Next step is to check if contacts on 5 CR are open (they are). Thus the trouble is probably in Solenoid 4. This marks the end of the quick visual checks. A voltmeter test shows that no voltage appears across the solenoid. The trouble: Solenoid 4 must be jammed in the forward position. The solution: replace or repair Solenoid 4.

SHOOTERS

WHERE EMFS DIAGRAMS FIT

Before EMFS diagrams became available, GM's process development staff furnished the same trouble-shooting helps as most others in the machine-tool industry—a schematic wiring diagram, a wiring panel connection drawing, and a brochure describing the sequence of operations. Using these three aids, the trouble shooter (at least the first few times he worked on a machine) read through the sequence-of-operation booklet until he came to the point in sequence corresponding to the trouble. Then he started looking for trouble in those components most likely to be involved. Big problem was to correlate the malfunction with the electrical diagram. Conventional sequence-of-operation brochures didn't always speed the job, because they were complex and hard to correlate with the schematic.

Craig saw the need for a new kind of diagram—one that would combine these things in one picture: mechanical motion, operation sequence, and electrical interrelationships. The EMFS diagrams looked like the answer to the prayers of production and maintenance managers. The method is still so new it has no "legal" status among engineering societies or equipment builder associations. But a number of GM plants are using it,

Wondering how the experts feel about EMFS diagraming? Just as FACTORY went to press, Electrical Editor G. C. Quinn got opinions from three of them. You'll find their words on the next page.

and some machine-tool builders and many individual machine-tool users have asked for full details. There's plenty of evidence that FACTORY's readers ought to consider adapting the system for their own use.

Proof of the idea lies in how much time it saves on repair jobs. It's too early for any statistics, but GM's staff has had to answer far fewer calls for trouble-shooting help on machines designed since the new system was developed. For instance, average trouble-shooting times on machinery at GM's divisions (where EMFS diagrams are in use) are well below average. Best of all, maintenance men are happy with the diagrams—much of the mystery in repairing a new machine for the first time is gone. There's no longer a need for one repair expert for each type of machine.

WHERE TO TRY EMFS FIRST

It may take a little time for your plant or tool engineering people and maintenance staff to become adept at working with the new system. What's more, you may have some prima donnas who like their specialty to appear difficult. Then, too, the system is not yet a ready-made "package" that you can adopt on the basis of wide experience by many industrial users. But Craig expects to see the system tried widely. He hopes improvements will come along as other users develop adaptations.

Most logical place to start using EMFS diagrams is on new machines. Why not old machines first? Because someone on your maintenance staff probably has become an expert on existing machines the hard way.

TIPS TO MAKE EMFS WORK

• **Show only those components directly involved in machine operation.** GM doesn't try to include those that aren't involved in the main operating sequence. Such things as fuses, master control relays, start-stop switches, automatic-manual switches, pilot lights, and continuously running motors appear only on the schematic. This simplifies the EMFS diagram, and keeps all the irrelevant or confusing information on the schematic (where it has to be).

• **Write in explanations on the diagram itself.** You can be as free as you want to. No American Standards Association or Joint Industry Conference (JIC) rules put your engineers in a straitjacket with this system.

• **Make each element visually useful.** For instance, if motion takes place over a curved path, make the heavy line a curve. When laying out the EMFS diagram, try looking at the machine from different views to select the one that makes physical relationships on the diagram easiest to grasp. Draw a picture if it will help.

• **Don't expect the system to do everything.** Up to now most of the circuits handled have involved two-state (for example, on or off, advanced or returned) components. There seems to be no good reason why analog-type components (like transistors, tubes, synchros, servo-valves etc.) can't be adapted to the system. But it hasn't been done yet and you may have to do some pioneering on your own.

HERE'S WHAT THE EXPERTS THINK

FACTORY asked several men close to the machine-tool control field to evaluate the new EMFS diagrams. Here are some of the comments:

From E. J. Grogan, Superintendent, Electrical Power Engineering, Sperry Gyroscope Company, Great Neck, N. Y.:

"Mr. Craig has broken through . . . traditionalism and is to be congratulated. EMFS diagrams expedite trouble shooting on complicated electrical-mechanical machine-tool control and can be followed by any trouble shooter with average training. We tried correlating EMFS diagrams for our tape-controlled machine tools, but found many electronic-electric sequences which were not visible. It needs additional development for more difficult circuitry but is a definite improvement."

From N. P. Bashor, Director, Electrical Controls, W. F. & John Barnes Company, Rockford, Ill.:

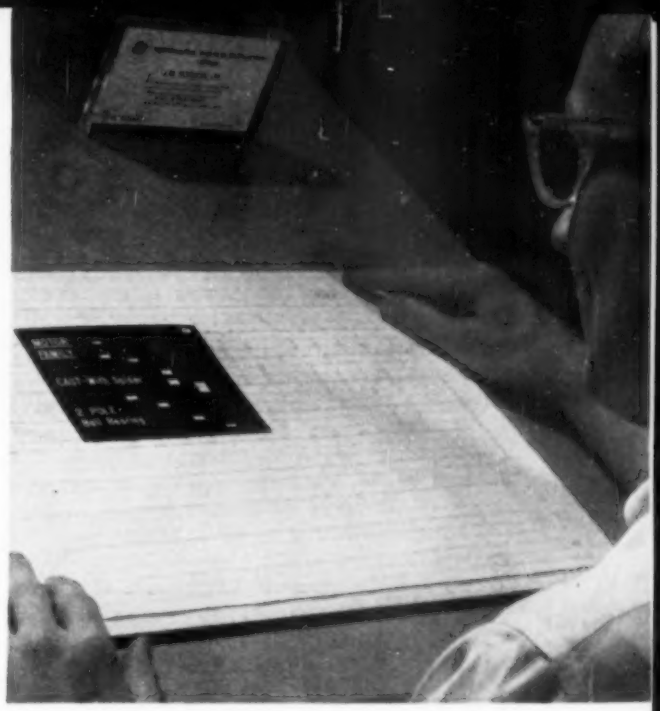
"The EMFS diagram does give a better picture of machine operations than a detailed write-up. However, we don't feel it is any more useful than our Sequence Step Chart and it will take longer to prepare. Displaying information when several operations take place simultaneously is also difficult. And maintenance personnel have to observe mechanical movements closely to avoid missing any. We think the ideal solution is the electrographic detector" (Barnes Company's own trouble-shooting device—Ed.).

From R. W. Kowitz, Manufacturing Engineering Department, Ford Motor Company, Dearborn:

"The new sequence diagram proposed by Mr. Craig has considerable merit. No matter how competent the engineer or electrician, each new electrical diagram must be studied in detail to determine the exact machine sequence. EMFS diagrams provide an easier way of determining the over-all machine sequence . . . and the reader need not be thoroughly familiar with all electrical diagrams, symbols and abbreviations. It is felt, however . . . that the diagram can be further simplified and drawing expedited by using the symbol for cylinders shown in the JIC (Joint Industry Conference) Hydraulic Standard. . . . The (EMFS) diagrams should aid considerably in localizing machine problems. We agree that use of the diagram will aid in further development and improvement of it. We all want to save time, so let's try it."

A template and a tabular report banish scheduling problems

Here's Easy-Way Job Scheduling



"I'VE GOT a customer who needs six motors—all for an odd-ball voltage, speed, enclosure, and frequency. When can we deliver?"

This kind of question comes up often here at G-E's Medium A-C Motor and Generator Plant. But it's really no problem these days. Either sales or production scheduling can give us the answer in a minute or two. Even before engineering or manufacturing knows just what's to be engineered or produced.

Our answer comes from a combination of right template and current factory-load data sheets (photo). Our new system takes advantage of faster manufacturing cycles in our motor plant. It's simple, easy to install. It's suitable for many plants where several thousand product variations are assembled from stock and non-stock subassemblies, for which specifications and raw materials are already available.

Many variables enter into scheduling in motor manufacture—shop and tool capacity, advertised delivery cycles, scheduled shop loads, product mix. What's more, components are manufactured in cycles that vary from days to weeks.

By H. R. REEP
Operations Research Specialist
Medium A-C Motor & Generator Dept.
General Electric Company
Schenectady, N. Y.

Because of multiple cycles and wide variety of motors, it has always been hard to project just how much load an order schedule (or set of schedules) will place on a given factory area. That's why we set a goal: to simplify and speed load-capacity analysis without creating an inflexible or expensive system.

BETTER SCHEDULES NOW

We've taken two steps:

1. Categorized into family groups all motors that use the same manufacturing processes.

2. Turned over to a card-programed digital computer the arithmetic for updating schedules.

With our categories, our sales, design, and scheduling people all talk the same language. Each standard design falls into one family. All motors in a family need the same time to go through manufacturing processes—and need much the same handling, too. Experience tells us the sequence of operations and the approximate man-hour load per unit for each family.

Our computer puts all the factory load together. We run a print-out report weekly (oftener if needed) with data from cards punched as orders come in. The report totals cycle time for each component, shows various manufacturing areas and capacity (in two columns at left), plus weekly load for each area for several weeks ahead (Week 1, Week 2, etc., in successive columns to the right). Copies of the report go to scheduling and sales.

Now the template: It's sized to fit the print-out report. We have a template for each group of families. To pick the right one the scheduler uses an index that classifies each type of motor by family. He lays template over print-out. Template windows reveal loading, week by week, for sequential manufacturing areas. Starting at left, with load for Week 1, he moves template horizontally to right (the farther to the right, the farther into the future) until windows reveal load figures that, when compared with capacity figures, will permit new loads to be added. Topmost template window then reveals the future week when delivery can be promised.

If the customer needs earlier delivery, scheduler can easily see where (and how much) overtime is needed—or where workload shifts or more capacity would help to speed the job.

The sales manager knows just as well as the scheduler what the shop load is for several weeks ahead. He needs only to pull the right template and place it over the report to tell the field salesman whether he can promise deliveries to meet special customer needs.

THE STEEL TALKS: WHERE THEY

EDITOR'S NOTE: The steel strike went on, it seemed, beyond endurance. It pinched the pocketbooks of the union members supporting the United Steelworkers' negotiators. It cut into sales and profits of the industry. Already it has hit other industries hard--autos, to mention only one. Before its effects peter out it will hit many another industry and plant.

What were the root causes of this long-drawn out dispute?

FACTORY's Washington reporter, Alan Adams, followed the turns as they came. He reports that there were two basic differences between management negotiator Conrad Cooper and union negotiator David McDonald:

Cooper and the industry were adamant against any wage increase that would put a push on prices (and so invoke the wrath of inflation-worried Washington. They were also dedicated to recovering management prerogatives in the realm of work rules that govern local plants.

McDonald was stubborn in seeking wage increases he thought the workers deserved. And he was immovably against company-demanded freedom in specifying the work rules.

Here is the teletyped story from Adams. His analysis is buttressed by his interviews with the principals on both sides, his reports on the efforts of government mediators, and by brooding through many long hours on his feet. He stood in the corridors of the Sheraton-Carlton hotel, company and union offices, and outside the President's oval executive office in the White House.

THE 1959 STEEL STRIKE--HALTED AFTER 116 DAYS BY A TAFT-HARTLEY INJUNCTION--IS THE HARDEST KIND OF LABOR-MANAGEMENT DISPUTE TO SETTLE. BUT IT MAY BE THE EASIEST KIND TO UNDERSTAND.

. IT CONTAINS ALL INGREDIENTS TO KEEP THE CONTEST BOILING. IT'S A GOOD BET THAT THE STRIKE WILL BE ON AGAIN IN LATE JANUARY--WHEN THE 80-DAY BAN IS AUTOMATICALLY LIFTED.

. SEEDS OF THE STEEL DISPUTE ARE PRESENT IN OTHER TIGHT BARGAINING SITUATIONS. IN THE MONTHS AHEAD, NEGOTIATORS WILL FIND MUCH THE SAME SITUATION IN SUCH DIVERSE INDUSTRIES AS RAILROADS, ELECTRICAL APPLIANCES, GLASS, COMMUNICATIONS, AND MISSILES.

. WHAT FINALLY HAPPENS IN STEEL WILL SHAPE THE OUTCOME IN THESE AND OTHER INDUSTRIES. IF THERE'S NO COMPROMISE--NO SETTLEMENT BEFORE JANUARY--CONGRESS WILL STEP IN WITH ITS SOLUTION.

. FIRST, LET'S DEFINE THE STEEL DISPUTE IN SIMPLEST TERMS. IT'S MADE UP OF JUST TWO ESSENTIALS: WAGES AND WORKING CONDITIONS.

. ADMITTEDLY, THESE ELEMENTS AREN'T UNUSUAL IN ANY COLLECTIVE BARGAINING SITUATION. WHAT MAKES THEM DIFFERENT IN STEEL IS THIS: ON WAGES, STEEL MANAGEMENT IS NEGOTIATING UNDER WHAT CAN ONLY BE DESCRIBED AS A "PRICE FREEZE." ON WORKING CONDITIONS, THE STEELWORKERS ARE NEGOTIATING FOR WHAT AMOUNTS TO A "JOB FREEZE."

. ON WORKING RULES, MANAGEMENT DEMANDS THE RIGHT TO MAKE THE RULES TO FIT ITS PLANT OPERATIONS--TO CHANGE THOSE NOW IN EFFECT SO IT CAN PRODUCE MORE EFFICIENTLY--AND AT LESS COST. THE STEELWORKERS INSIST ON A WAGE HIKE AS PROPER COMPENSATION FOR AN INCREASE IN PRODUCTIVITY.

. THERE'S ONE OTHER ELEMENT--THE TIMES WE LIVE IN. STEEL EXECUTIVES, LIKE OTHER EMPLOYERS, HAVE A NEW LEVERAGE. PUBLIC CONCERN OVER INFLATION AND UNION RACKETEERING HAS TIPPED THE SCALES IN THEIR DIRECTION. FACT IS, EACH SIDE IN THE STEEL DISPUTE HAS ACTED AS IF THE PEOPLE WERE WITH IT. SO NOTHING HAPPENED.

. CHAIRMAN OF THE PRESIDENT'S EMERGENCY FACT-FINDING BOARD, GEORGE TAYLOR, AFTER THE STRIKE HAD BEEN ON ALMOST 100 DAYS, REPORTED TO THE WHITE HOUSE: "THE BOARD CANNOT POINT TO ANY SINGLE ISSUE OF ANY CONSEQUENCE WHATSOEVER UPON WHICH THE PARTIES ARE IN AGREEMENT."

. TAKE A LOOK AT WAGES. BOTH SIDES AGREED A PAY INCREASE SHOULD NOT BE MADE UNTIL THE SECOND YEAR OF THE CONTRACT. THE UNION ASKED 7¢. THE INDUSTRY OFFERED 6¢. THE TWO SIDES ARE EVEN IN AGREEMENT ON AN INCREASE IN LABOR GRADES TO MAINTAIN SKILLED DIFFERENTIALS. COST-OF-LIVING PAYMENTS COULD BE MADE THE SECOND YEAR UNDER PROPOSALS BY BOTH SIDES--THOUGH UNDER DIFFERENT CIRCUMSTANCES.

. BUT WHEN IT COMES TO TOTALING COSTS, THE TWO SIDES WORK WITH DIFFERENT COMPUTERS. THE UNION PRICE TAG FOR ITS OWN DEMANDS IS 20¢ OVER TWO YEARS--THE INDUSTRY TOTAL FOR THE SAME THING, 32.4¢. MANAGEMENT ESTIMATED ITS OWN OFFER AT 33¢ OVER THREE YEARS. THE UNION PUT IT AT 24¢. STILL, THESE WOULD NOT BE INSURMOUNTABLE DIFFERENCES--IF THE "PRICE FREEZE" BARGAINING DIDN'T

COLLAPSED—WHAT'S THE SOLUTION?

MAKE EVERY PENNY COUNT.

. BUT ALL THIS GIVE-AND-TAKE ON MONEY WAS STILL CONTINGENT ON SETTLING THE ISSUE OF WORKING RULES. ON THIS THE PARTIES ARE JUST AS MANY MILES APART AS WHEN THEY FIRST STARTED TALKING. THE INDUSTRY OFFERS TO SEND THE ISSUE TO ARBITRATION, PROVIDED THE QUESTION GOING TO THE ARBITRATOR ASKS FOR WAYS TO IMPROVE MANAGEMENT EFFICIENCY. STEELWORKER PRESIDENT DAVID J. MCDONALD SAYS THE UNION WILL AGREE TO RULES CHANGES "OVER OUR DEAD BODIES" ONLY.

. SINCE 1947, STEEL CONTRACTS HAVE CONTAINED THE NOW-FAMOUS 2-B CLAUSE. IT SAYS, ESSENTIALLY, THAT MANAGEMENT MAY MAKE ANY JOB CHANGES--THIS INCLUDES CUTTING DOWN JOBS--WHEREVER IT INTRODUCES NEW EQUIPMENT. THIS MEANS THE INDUSTRY CAN AUTOMATE WITHOUT PENALTY. BUT WHEN MANAGEMENT SEEKS TO TRIM JOBS JUST THROUGH GREATER EFFICIENCY, THE UNION CAN PROTEST THROUGH THE GRIEVANCE PROCEDURE--AND BLOCK THE JOB CUTBACKS.

. THAT'S WHAT THE CLAUSE SAYS. HOW DOES IT WORK IN PRACTICE? HERE ARE SOME KEY WORKING-RULES CASES THAT HAVE GONE THROUGH ARBITRATION:

. DURING A BUSINESS RECESSION, REPUBLIC STEEL ATTEMPTED TO FILL ABSENTEE VACANCIES WITH WORKERS PAID ON A STRAIGHT-TIME BASIS, RATHER THAN ON OVERTIME. THE ARBITRATOR RULED THAT REPUBLIC WAS REQUIRED TO PAY OVERTIME BECAUSE IT WAS THE LONG-STANDING PRACTICE.

. U. S. STEEL CORP. ATTEMPTED, AT A TIME WHEN PRODUCTION HAD FALLEN OFF, TO COMBINE "MIXER" AND "WEIGHER" JOBS TO ELIMINATE IDLENESS. THE ARBITRATOR SAID NO.

. IN NATIONAL TUBE DIV. OF U. S. STEEL THE COMPANY SOUGHT TO DISCIPLINE AN ABSENTEE EMPLOYEE BY DEPRIVING HIM OF OVERTIME WORK. THE ARBITRATOR SAID SUCH OVERTIME WAS AN ESTABLISHED PRACTICE EVEN FOR A CHRONICALLY ABSENT EMPLOYEE AND HE WAS ENTITLED TO IT.

. IN A UNIVERSAL ATLAS CEMENT CO. ARBITRATION THE COMPANY WAS BARRED FROM OFFERING EMPLOYEES IN THE RAW MILL A CHANCE TO DO CLEAN-UP WORK WHEN THE DEPARTMENT WAS NOT FUNCTIONING. THE DECISION HELD THAT THE WORKING RULE PROVIDED THAT SUCH EMPLOYEES COULD NOT BE PAID LESS THAN THE REGULAR RATE.

. IN MANY CASES LIKE THESE THE COMPANY IS ABLE TO SHOW JUSTIFICATION, UNDER THE 2-B CLAUSE, FOR CHANGING WORK SCHEDULES. IN 124 ARBITRATION CASES IN U. S. STEEL PLANTS SINCE 1947, THE STEELWORKERS HAVE WON JUST 14. THE PROBLEM HINGES ON THE INDUSTRY'S DEMAND TO MAKE COST-SAVING CHANGES WITHOUT BEING TIED TO ARBITRATION PROCEDURES. TO THE UNION, THE DEMAND SPELLS "SPEED-UP" AND A THREAT TO ESTABLISHED JOBS.

. WHAT'S THE WAY OUT? THERE'S A POSSIBILITY--A SLIM ONE--THAT IT CAN BE DONE BY NEGOTIATION. IF SO, THE SETTLEMENT WOULD RESEMBLE THE AGREEMENT REACHED BETWEEN THE UNION AND KAISER STEEL CORP. THE REST OF THE STEEL INDUSTRY TAGS THIS AS TOO HIGH-PRICED (22.5¢ OVER TWO YEARS) AND AN INDUSTRY DEFEAT ON THE WORKING-RULES ISSUE.

. THE KAISER AGREEMENT DID NOTHING TO CHANGE THE STANDARD WORKING-RULE CLAUSE. AS FOR THE MONEY PACKAGE, KAISER SAYS IT CAN ABSORB THE COST BECAUSE IT IS A HIGH-EFFICIENCY, LOW-SENIORITY OPERATION AND THAT THIS MAKES KAISER'S A REASONABLE DEAL.

. THERE'S ANOTHER ITEM IN THE KAISER AGREEMENT THAT MAY HOLD THE KEY TO A STEEL SETTLEMENT. THE CONTRACT SETS UP A COMMITTEE TO DEVISE A SHARE-THE-PROGRESS PLAN AMONG STOCKHOLDERS, THE UNION, AND THE PUBLIC. THREE TOP-FLIGHT ARBITRATORS--GEORGE W. TAYLOR, JOHN DUNLOP, AND DAVID L. COLE--WILL SERVE WITH THREE MEMBERS FROM EACH SIDE TO FIND A PEACE FORMULA FOR THE STEEL INDUSTRY. THE FORMULA IS TO COVER PRODUCTIVITY, COST-OF-LIVING GAINS, AND EMPLOYMENT STABILITY FOR THE WORKERS; LABOR COST SAVINGS AND NECESSARY EXPANSION FOR THE COMPANIES; STRIKE-FREE BARGAINING FOR THE PUBLIC.

. EVEN THE WHITE HOUSE NOW FAVORS A GENERAL LABOR-MANAGEMENT CONFERENCE TO TRY FOR AN END TO WARFARE IN THIS AREA. IF LABOR AND MANAGEMENT CAN'T RESOLVE THEIR DIFFERENCES BY NEGOTIATION OR BY TURNING THE PROBLEMS OVER TO STUDY, THERE'S NO QUESTION THAT IT WILL BE DONE FOR THEM. CONGRESS IS WAITING TO PROVIDE THE SOLUTION--COMPULSORY STRIKE-SETTLING LEGISLATION.

ADAMS/DESK

530PM KD

HE PEEKS As parts cycle to a position outside his window, he checks paint job.

This Inspector Is a Bird

This pigeon is little different from those that roost on the county courthouse—except that he has been trained to do 99% accurate visual inspection of small parts. He has good eyes. He likes his work.

This pigeon was trained for work in a manufacturing plant. He could be working today. Instead, he's in temporary retirement at Columbia University. Reason: fear of labor repercussions.

This pigeon proves the avenues of approach to the solution of manufacturing problems are neither closed off nor hemmed in. Animals could help industry just as bloodhounds find lost children and horses sometimes pull stalled cars out of the mud. Animals could help in time of labor shortage. Better than machines in some cases.

Columbia University's Dr. William W. Cumming conducted the pigeon experiment. He's an experimental psychologist specializing in principles of learning. With an associate, Dr. Cumming also studies animal learning under a grant from the National Science Foundation. The learning patterns of animals shed valuable light on human learning and behavior.

Photos by Leonard Kamsler

HE PECKS The window is a rejection switch. He pecks on it when he finds a bad part.

HE PROFITS He gets food when he rejects a bad part. A mistake—the lights go out.

The professor and the manufacturing engineer from a large company were casually chatting about their respective jobs. Said the engineer: ". . . the machine I designed inspects okay, but it's out of commission more than half the time. And it was as expensive as sin to build."

Said the professor: "What you need is a good eye, and a cheap nervous system that can learn to make a simple decision. Pigeons could do the job."

This conversation launched the pigeon experiment. And it was a complete success until an industrial relations V.P. called a halt for fear the pigeons would upset the company's upcoming labor negotiations.

Training the birds was paid for by the company. And the company built a training apparatus to simulate a production line. Beside the line is the pigeon's work station (photos above). Training was done with a man in attendance, but it could have been done automatically. Here's how it worked:

The pigeon was placed in the work station, a plastic door closed to keep him in. The training apparatus cycled parts to a position just outside the pigeon's square glass window. (He peeks, above.) Some of the parts had paint defects, others did not.

The parts engaged with a turning wheel at the position in front of the window. They turned slowly so the pigeon could see all sides.

Each part remained in front of the window until accepted or rejected. No parts passed unchecked. To accept a part the bird pecked the round opaque glass at right of his window. It's a switch (see right photo). To reject, he pecked the window itself. It's a switch, too. At first he did this accidentally. But he soon learned the system.

His reward for a correct decision to reject was food. His reward for a correct decision to accept was less tangible, but satisfying to him; He got a new part to inspect, because the line cycled. And his liking for this job kept increasing.

If he made a wrong decision, he was forced to take a 20-second break. The lights went out. He couldn't see to work. This upset him. If the door were open, he would sadly leave the work station. When the lights went on again, he would hop back, start to work.

Working the birds follows the same general technique, except that a trained bird does not require reward for every right decision—or punishment for every error. After training, the birds work at 99% accuracy with only about 5% of the parts cycled past their window "coded." On a plant assembly line, the coded parts would be pre-inspected, and magnetized to trigger the apparatus for payoff or punishment. They would be recycled through the line continuously, at random intervals. The coded parts would control the food system (for correct decisions on rejects) and the lights (to punish mistakes). When production is simulated in the laboratory, the birds inspect about 1100 parts per hour. About 50 of these are coded.

Why pigeons? They're a common laboratory animal. They're inexpensive ($1.25 per bird; about $1 per month to feed). They have excellent eyes. They learn fast. They live about 20 years. Dr. Cumming (inset, lower left) uses pigeons for research on learning that he and an associate are doing under a grant from the National Science Foundation. The bird's learning patterns are being studied because they can often be applied successfully to human training.

Pigeons have been trained for inspection work before. But in that case, too, they were laid off at the last moment. A drug company had trained the birds to pick out pills that were inadequately coated. But the idea scared the sales department. Even though the birds were hermetically isolated from the pills, salesmen feared the association with pigeons would be just too much for the public to swallow.

Maintenance Manager C. N. Wiggins of United Air Lines, seen here (right) with assistant H. Hale, is dramatically cutting operational delays at his firm's sprawling West Coast base. Productive activity there has gone up 43% in less than three years.

Foremen spot weaknesses sooner, correct them faster. Workers spend less time waiting, walking, wondering. Reason for all this—

Work Sampling in Maintenance

"Listen to what work sampling is telling you. Accept and study what it says, and take action. Then check the results by more work sampling."

With this somewhat lofty-sounding proverb, C. N. Wiggins of United Air Lines has succeeded in lifting from 54% to 77% the productive use of a worker's time at his firm's giant San Francisco maintenance center. This relative gain of 43% is the result of a cut in worker "transit time" from 30% to 12% and in "delay time" from 16% to 11%.

Of itself, Wiggins emphasizes, work sampling doesn't directly improve efficiency. But it does point out where losses in efficiency are occurring. It puts pressure on supervisors and higher management to do something about these inefficiencies.

Here's how Wiggins applied his proverb to real problems in the plant:

• Work sampling showed that too much worker time was being spent in transit. This is a special problem at the UAL base, since it's spread out over 142 acres. So Wiggins put a truck to work to haul personnel and materials around the base, running on a scheduled route. Now he even samples the truck operations from time to time to make sure the passengers aren't joy-riding past their correct stops.

• Work sampling showed that men were spending too much time getting tools from the toolroom. So UAL distributed some tool cabinets throughout the plant. One of the results: a saving of 10% in traveling time in the metal-working department of 22 men. Two tool

cabinets in that area (cost $1000 each) paid for themselves in two months.

• Work sampling showed too much traveling time to a central warehouse for materials. So UAL added some point-of-use storage facilities, thus placing materials closer to where needed.

• Work sampling showed a high percentage of on-the-job delays. Investigation disclosed that lack of clear specifications was the major reason. So Wiggins spent a lot of time emphasizing to his people the importance of giving clear job instructions. He arranged for all job instruction cards to pass over his desk so he could check them for clarity. Those he couldn't understand he returned for rephrasing to the foreman who had planned the job.

After several years' use, the UAL work-sampling program has disclosed almost all major operating weaknesses. The over-all scores in worker-activity performance have changed very little in the past 12 months. Present summaries of on-the-job time show scores of 80% in "direct productive," 11% in "direct delays," and 9% in "direct in transit." With "personal" time and "indirect" time (safety, medical, office calls, etc.) running about 2% and 1%, respectively, UAL's true maintenance productive activity is about 77%.

But to Wiggins this good performance gives no excuse to cut back or drop work-sampling activities. The technique continues to serve as a monitor of performance. And UAL keeps up a continual surveillance and search for ways to shave off inefficient procedures or habits. For example, take the report for the week of June 12 (see page 75), which shows 33 observations for code 1-2-8-3 ("Direct Delays—Exchange of Information between Mechanics"). To Wiggins this meant that quite a few men were just shooting the breeze. So he cautioned foremen about it. Gradually this score returned to a normal level.

Incidents like this are good selling points for both workers and supervision of the effective yet impersonal role of work sampling. It never puts the finger on an individual worker. Yet it does alert supervision to costly or wasteful practices. It helps overcome the inherent difficulty in maintenance work of closely supervising widely dispersed personnel. Of course, the men realize that flagrant infractions or any rash of "goofing off" will come to light and be traced to the source. But they also know that sampling is primarily to provide anonymous data.

Wiggins has made sure that everybody realizes that changes made to improve efficiency come directly out of information tabulated by work sampling. And that the big gains, such as time saved in cutting traveling and delay losses, generally spring from the failure of supervisors—not of rank and file—to do a good job in planning, scheduling, and other supervisory activities.

But this fact should not be construed as a reflection on maintenance supervision. It would reflect badly if supervision did not act on the information work sampling now gives it. But supervision never had this tool before. Now supervision and higher management have a means of determining the time utilization of its men according to productive and non-productive activities. This automatically spotlights inefficient or irregular areas and leads to studies for ways to improvement.

The UAL program is in essence, therefore, a supervisory and management improvement program. It is not concerned with measuring worker effort or pace. It doesn't attempt to rate performance, but simply to determine what the worker is doing—or not doing. What counts most at UAL is that work sampling allows management to concentrate on minimizing the non-productive areas. "For getting at areas of biggest savings first," says Wiggins, "this technique takes the cake. It's low-cost, simple to administer, dependable." It can tackle low-productivity areas through better supervision, methods improvement, work simplification, and work measurement, when and as it chooses.

HIGHLIGHTS OF UAL'S PROGRAM

Work sampling requires an adequate number of random observations of the activities of maintenance individuals throughout the plant several times a day, and every day. It's that simple in concept. But how you introduce the program, and how well you design and administer it, can affect the degree of its success, and extend the benefits. Here's how UAL dealt with these and other important influences.

INTRODUCING THE PROGRAM

First step by Wiggins was presentation of an outline of the program to top management of the Maintenance Base. He got favorable management reception and authorization to install it. Next, he sought union acceptance. He met with union representatives—stewards and grievance committees—to spell out the details. They approved of it, and promised cooperation.

Final step was to convince the worker he was not being made the victim of spy tactics. At a general meeting of all employees Wiggins explained what UAL was going to do, and invited questions from the floor. He got scores of questions—the meeting lasted 1½ hours. It closed with a standing invitation for any one to present questions to Wiggins personally at any time. Except for explanatory discussions in subsequent meetings of the grievance committee, no further questions were ever raised.

There has been minor resistance from time to time, and from group to group. But the men generally understand what work sampling is trying to do. Acceptance is made easier by the anonymity of the reports. At the end of a round the observer destroys the checklist he uses to locate the men or gives it to a union steward. No supervisor or department manager ever sees one. Workers know they can find out in what activity they were rated on a particular observation. "Just ask the observer," Wiggins tells them.

SETTING UP THE CATEGORIES

The activity classifications now in use at UAL are shown on the next page. Only major change since the start has been the addition of primary category No. 4 ("Not Observed").

For convenience in recording observations, UAL uses a 4-digit activity code. It has four primary categories: "Direct," "Personal," "Indirect," and "Not Observed," designated by primary digits 1 to 4. Each of these

Keys to pinpointing all inefficiencies in maintenance operations are the activity code and work sampling report at right. A competent observer, touring the shop several times a day, uses them to record, classify and compile what workers are actually doing.

ACTIVITY CODE

(1st DIGIT)	(2nd DIGIT)	(3rd DIGIT)	(4th DIGIT)
1—Direct	1—Productive		
	2—Delay	1—Waiting for Tool 2—Waiting for Material	1—At Toolcrib 2—At the Job
		4—Deficient Scheduling	1—No Job Assignment 2—Waiting for Partner
		5—Waiting for Information or Instruction	1—Avoidable 2—Unavoidable
		6—Waiting for Transportation	1—With Tools or Material 2—With No Equipment (Tools or Material)
		7—Interference from Other Craft	
		8—Exchange of Information	1—Foreman 5—Phone 2—Lead 6—Catalog 3—Mechanic 7—User 4—Engrs. 8—Planner
	3—In Transit	1—To or From the Job 2—For Tool or Equipment 3—For Material 4—Checking Job 5—Pick-Up or Delivery of Equipment 6—To Mtce. Tool Crib 7—Back to Job After Break Period from Cafeteria	1—Warehouse 2—Test Cell 3—Building #15 4—Building #10 5—Building #74 6—Cafeteria 7—Adm. Building 8—B-29 9—Terminal 0—Plant Maintenance
	4—Make Ready		
2—Personal	4—Not Working	1—Near Work Area 2—Away from Work Area 3—Quitting Early	1—3:30–3:45 Outside 2—3:45–3:55 Inside 3—12:00–12:15 Outside 4—12:15–12:25 Inside
3—Indirect	1—Union Mtg. 2—Safety Mtg. 3—Mainliner Activity 4—Information in Office 5—Medical 6—Credit Union		
4—Not Observed			

is broken down by second-, third-, and fourth-degree digits to provide a detailed analysis of activity. Here are the definitions of the primary and important secondary code subdivisions:

- **Direct Productive**—Worker is at the job doing the job. *Example:* Any man at work is Code 1-1.
- **Direct Delay**—Worker is at the job site but not working (reasons listed in the third and fourth subdivisions). *Example:* Waiting at the toolcrib for materials is Code 1-2-2-1.
- **Direct In Transit**—Worker is traveling away from job site (reasons given in the third and fourth subdivisions). *Example:* Plumber en route from shop to terminal to check a job is Code 1-3-4-9.
- **Direct Make Ready**—Worker procuring equipment necessary to the job. *Example:* Getting rainwear on a wet day is Code 1-4.
- **Personal Time**—Worker not working for reasons given in third and fourth subdivisions. *Example:* Worker not working, outside his work area before quitting time, is Code 2-4-3-1.
- **Indirect Time**—Worker has been authorized to participate in one of the six functions listed in secondary classification. *Example:* Worker attending a safety meeting is Code 3-2.
- **Not Observed**—Worker has not been seen. This score permits a reconciliation of actual number of observations with intended. And should this figure exceed a normal 4-5%, it will suggest exploring for the reason why. In a way it's a check, too, on the alertness of the observer in spotting his men.

To get still more mileage out of observations UAL also set up a 2-digit number identification for each of its nine craft or work units. They run in increments of 10, from 10 to 90, for the nine crafts involved. Moreover, it has subdivided the entire UAL plot into 10 areas, and assigned single digit numbers (running from 0 to 9) as defined in the fourth subdivision of Code 1-3. Thus the observer is able to code all these key data: (1) type of mechanic, (2) what he is doing, and (3) the area he is observed in. In most cases this code combination also indicates the reason for such activity.

Lately Wiggins is of a mind to drop Code 1-4 (direct make ready). Totals have dropped too low for statistical significance. Reason for this drop is a 1- to 5-min. safety meeting at the start of each shift. This cuts off needless conversation, gets the men promptly on the job.

The fourth-degree digit breakdowns in the "Personal" (primary No. 2) are also now of little value. Originally Wiggins perceived that there were four periods of the day when the men were not working to capacity—in a statistical sense: (1) beginning of the

PLANT MAINTENANCE WEEKLY WORK SAMPLING REPORT

FOREMAN TOTAL - PLANT MAINTENANCE — TRUE PRODUCTIVE ACTIVITY 77%

PRODUCTIVE ONLY		CUMULATIVE	4 WEEKS
Direct Productive	1-1	81%	79%
Direct Delay	1-2	6%	6%
In Transit	1-3	13%	15%
Make Ready	1-4	0%	0%

TOTAL OBSERVATIONS		CUMULATIVE	4 WEEKS
Personal	2-4	1%	2%
Total Direct Productive	1-1, 1-2, 1-3, 1-4	99%	97%
Indirect	3	1%	1%
Unobserved	4	4%	4%

NUMBER OF OBSERVATIONS FOR WEEK OF 12 JUNE

DIRECT PRODUCTIVE 1-1														839
DIRECT DELAYS														62
1-2-1-1		1-2-4-1	1	1-2-7		1-2-8-2	10	1-2-8-6						
1-2-1-2		1-2-4-2		1-2-6-1	1	1-2-8-3	35	1-2-8-7	5					
1-2-2-1	2	1-2-5-1		1-2-6-2		1-2-8-4	2	1-2-8-8	3					
1-2-2-2		1-2-5-2		1-2-8-1	5	1-2-8-5		1-2-8-9	2					
DIRECT IN TRANSIT														113
1-3-1-1		1-3-2-1	1	1-3-3-1		1-3-4-1	2	1-3-5-1		1-3-6-0	5			
1-3-1-2	5	1-3-2-2		1-3-3-2	1	1-3-4-2		1-3-5-2		1-3-7-3				
1-3-1-3	25	1-3-2-3	1	1-3-3-3	2	1-3-4-3		1-3-5-3		1-3-7-4				
1-3-1-4	9	1-3-2-4		1-3-3-4	1	1-3-4-4		1-3-5-4		1-3-7-5				
1-3-1-5	3	1-3-2-5		1-3-3-5		1-3-4-5		1-3-5-5		1-3-7-6				
1-3-1-6	2	1-3-2-6		1-3-3-6	2	1-3-4-6		1-3-5-6		1-3-7-9				
1-3-1-7	1	1-3-2-7		1-3-3-7		1-3-4-7	1	1-3-5-7		1-3-7-0				
1-3-1-8	7	1-3-2-8		1-3-3-8	1	1-3-4-8		1-3-5-8						
1-3-1-9		1-3-2-9		1-3-3-9		1-3-4-9		1-3-5-9						
1-3-1-0	33	1-3-2-0	4	1-3-3-0	5	1-3-4-0	1	1-3-5-0	1					
MAKE READY 1-4														0
PERSONAL 2-4-1	6	2-4-2	2	2-4-3-1	2	2-4-3-2	3	2-4-3-3		2-4-3-4				13
INDIRECT 3-1	2	3-2	6	3-3	4	3-4	3	3-5	2	3-6	1			18
UNOBSERVED 4 48										TOTAL OBSERVATIONS				1045

REMARKS

shift, (2) ten minutes before lunch, (3) imediately after lunch, and (4) one-half hour before quitting time. On early surveys, UAL assigned a code designation to various periods of the day, and kept a record of how many people were not engaged in productive labor (who should have been) in each period. Out of this study Wiggins distilled the four periods shown in the fourth-degree category as danger periods, and instructed supervisors to watch them accordingly. The terms "inside" and "outside" indicate whether a worker is in or away from his prescribed work area. The observer finds whether an absence from the work site is authorized by checking with the foreman or lead man prior to inspecting the area. Observations in these categories are now so infrequent there's no further need for a detailed study.

SELECTING THE OBSERVER

In Wiggins' opinion this is the most important step in the program. For two reasons:

First, the observer must have the confidence of both workers and management. Such traits as complete honesty, fairness, and a pleasant personality are absolute requirements. Yet the observer also has to be pretty thick-skinned and objective, so he can do his job without becoming involved in personalities. In short, he's got to be a camera that reports exactly what he sees.

Second reason for careful selection is the need for a man who is thoroughly conversant with plant operations and acquainted with all maintenance personnel so that he can identify them, know what they are doing. UAL screened its personnel, found a mechanic with 13 years' seniority and all the basic qualifications. It arranged for an intra-departmental transfer to a special-assignment classification that made the observer administratively responsible to the department manager. And it trained him in the philosophy and practices of work sampling before putting him to work.

MAKING AND RECORDING OBSERVATIONS

To insure that all observations are random—a basic tenet of work sampling—UAL set up a chart of random numbers from which it has compiled a permanent random guide of routes on one letter-size sheet.

The observer starts at an area designated at the top left of the page, and follows down the column, then to the second column, and so on, returning at the end to the first column. He starts the next round where he left off in the previous round. Thus the observer starts at different places each time, and arrives at each area at a different time. Also, he is careful to change di-

rection and path of travel. First thing in the morning the observer checks with the foremen and planning-scheduling men, while they're centrally located, to find out where all the workers are supposed to be. He carries with him a complete roster of workmen on which are pre-listed the names of all workers in their respective craft groups. The observer notes on this list any absentees or out-of-the-ordinary assignments for the individuals concerned.

To insure the utmost in randomness of observations, the observer is also guided by a route sheet for his observations. It's established in advance (based on the table of random numbers found in the back of any statistics book) and specifies the order in which he will observe the craftsmen in any plant area. The order of observations changes with each different area.

As the observer reaches an area and spots a worker in the craft designated by the random guide, he makes his observation at once, then checks him off in the first, second, or subsequent vertical run of boxes (depending on which round it is). He follows that procedure until all men in view have been recorded. When finished with one area he proceeds to the next. He's on the go all day, every day, and catches all but 4-5% of a total of some 165 men each round. There is no hunting for a missing worker. If the worker is not at the job site he may be spotted traveling later. All unchecked workers are recorded as "Unobserved" (Code 4) at the close of each round.

Observations are made and recorded at the instant the observer identifies a worker. He questions the worker only when he can't see or figure out what he's doing. With a shop veteran observer such occasions are rare. No observations are made during lunch hour, coffee break, and wash-up time.

The observed activity is recorded on an IBM tabulating card—one for each observation. Originally the observer used "mark-sense" cards (pencil notation) but now he uses the IBM Port-a-Punch method. This produces a punched card right on the spot, eliminates the need for intermediate key punching. The accumulation of punched cards is sent daily to the tabulating section for a quick daily run and tab report.

CHECKING RELIABILITY OF DATA

Once the randomness of observations has been assured, work-sampling data still need continuing checks on accuracy and reliability. Purpose is to check whether enough readings have been taken, and whether the readings represent typical and unchanged conditions. As for accuracy, UAL's observer takes from 300 to 500 readings per day, for a total of 1500 to 2500 per week, or at least 4000 per month. Since UAL is careful to use only weekly accumulations for score keeping, Wiggins considers he's statistically safe. And he is, for any and all categories, right down to four digits, provided none is too low in its relative per cent of the total.

For example, for 2500 observations, a category comprising 10% of the total will give a precision range of 12.5% (of 10%), or in absolute terms, a swing from 8.75 to 11.25% (for 95% of all readings—no sampling can be 100% statistically accurate). A 20% category will have a precision range of 8%; 30% will give 6%; 40%, 4.75%; 50%, 4%; 60%, 3.2%; 70%, 2.5%; 80%, 2.0%; and 90%, 1.4% precision. (See "Work Sampling Without Formulas" FACTORY, March 1954, for a quick graphic method of developing these figures.) Thus the UAL category of "direct productive" activity (almost 80% of the total) is reasonably reliable. But for 2500 observations the smaller elements of "direct delay" (about 6% of total) and "direct in transit" (about 15% of total) are accurate only within swings of 16% (of 6%) and 7.7% (of 15%) respectively. For a precision of 5%, these elements would require over 22,000 and 9,300 observations respectively. This sort of precision is not required at UAL, however, to detect the *existence* of small but inefficient practices as revealed by the third- and fourth-degree categories. Moreover, anyone needing more accuracy can always tailor a special work-sampling study to a specific subject by considering only two elements—the one in question and "all others."

For reliability, Wiggins compares each daily score for reasonable similarity. He does not apply statistical checks for their soundness. If the nature of daily work conditions does not change during a weekly sampling period (weather conditions, big emergency jobs, special projects, or other abnormal activities), he can feel reasonably safe in this omission. But since it is so easy to check the daily results graphically ("Work Sampling Without Formulas") to make sure they are "in control," there's more reason to do it regularly than not to. Such a control check is now accepted good practice in work sampling.

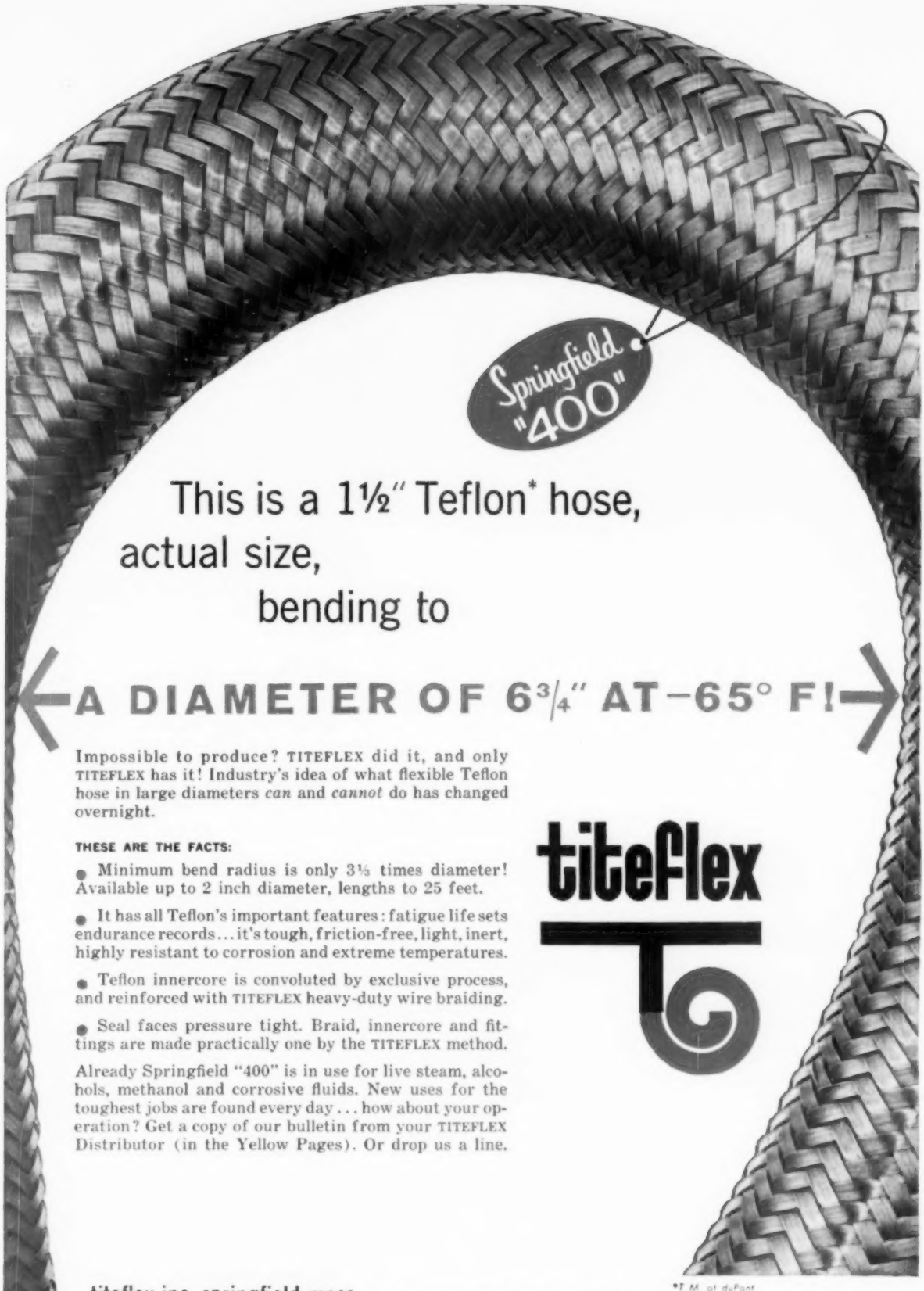
This statistical oversight, however, does not nullify the advantages of UAL's 4-digit breakdown. Wiggins relies only on the 2-digit summaries for his "true productivity" calculations. He uses the 3- and 4-digit breakdowns only for comparison and study for irregularities.

REPORTING RESULTS

Daily compilations at UAL are summarized into a "Weekly Work Sampling Report" (shown on preceding page) that provides a cumulative average of weekly returns for two periods: (1) entire period since work sampling began some three years ago, (2) latest 4-week average score, obtained by adding the current week, dropping the oldest week. These are shown in left and right columns respectively under "Productive" and "Total Observations" heads.

Each foreman gets a similar report for his craft group. Wiggins holds a weekly review, aiming the discussion chiefly at all non-productive activities or at any signs of irregularity. The idea is always to minimize or eliminate them.

Here's a word of caution, and perhaps encouragement. Wiggins found worker performance going down in the beginning weeks of sampling. He says it's likely to happen anywhere until the men get used to the system. After that? Well, just look again at his experience—a 43% boost in productive activity at UAL in the three years of work sampling.



This is a 1½" Teflon* hose, actual size, bending to

A DIAMETER OF 6¾" AT −65° F!

Impossible to produce? TITEFLEX did it, and only TITEFLEX has it! Industry's idea of what flexible Teflon hose in large diameters *can* and *cannot* do has changed overnight.

THESE ARE THE FACTS:

- Minimum bend radius is only 3½ times diameter! Available up to 2 inch diameter, lengths to 25 feet.
- It has all Teflon's important features: fatigue life sets endurance records... it's tough, friction-free, light, inert, highly resistant to corrosion and extreme temperatures.
- Teflon innercore is convoluted by exclusive process, and reinforced with TITEFLEX heavy-duty wire braiding.
- Seal faces pressure tight. Braid, innercore and fittings are made practically one by the TITEFLEX method.

Already Springfield "400" is in use for live steam, alcohols, methanol and corrosive fluids. New uses for the toughest jobs are found every day... how about your operation? Get a copy of our bulletin from your TITEFLEX Distributor (in the Yellow Pages). Or drop us a line.

titeflex

titeflex inc. springfield mass. PACIFIC DIVISION • SANTA MONICA • CALIFORNIA

*T.M. of duPont
**T.M. of Titeflex, Inc., Pat. Pend.

For more facts Circle 479 on Reader Service Card

FACTORY EQUIPMENT NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

Gage Spots Trouble Areas

Simple-to-use direct-reading ultrasonic gage tells you at glance exact (to 1% of full-scale accuracy) thickness of metals, plastics, and liquids. For maintenance purposes, it spots corrosion or flaws in pipes and storage vessels. On production line, it detects laminations or stringers in welding plate. Reading measurement in inches, directly from calibrated dial, eliminates interpreting values on oscilloscope and charts. Operator needs little or no experience to use this portable radio-size detector in the field or in confined areas. Transistors and low-voltage batteries make it explosion-resistant.

Thickness is measured by pulse-echo method. Unlike resonance-thickness gage, this method permits measuring unparallel, pitted, or rough surfaces. Operator sets dial for material being inspected. Maximum thickness measurable is over 3 ft. (aluminum or steel); minimum thickness is 0.060 in. in aluminum and 0.070 in. in steel. *Sperry Products, Inc.* (Circle 101).

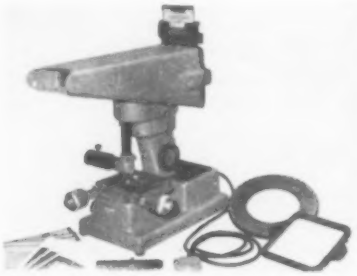
102—Audio-Visual Training machine shows trainee step-by-step assembly process by synchronizing color slides with customized tape recording. Each trainee sitting before viewer sets his own pace. Reduces learning time, scrap; releases supervisors as instructors. *Lear, Inc.*

103—Ultrasonic Generators use solid state devices (rather than electronic tubes) to reduce weight up to 80%, size up to 50%. Available in 500, 750 watts. Entire line will include 1000- and 2000-watt ratings for cleaning 1½- to 16-gal. tanks. *Westinghouse Electric Corp.*

104—Adjustable Platform rises to any height from 3 to 7 ft. with 1000-lb. load by means of manual hydraulic pump on 36x77-in. deck. Moves on casters for maintenance or general work. Has tow bar and pintle hook for towing. *Aero-Test Equipment Co.*

105—Mop Handles, of lightweight aluminum are ideal for cleaning and maintenance work where women are employed. Gray-luster finish resists chipping, scratching. Will not break or splinter. Two models with clamps or springless jaws, in 54- and 60-in. lengths. *The Fuller Brush Co.*

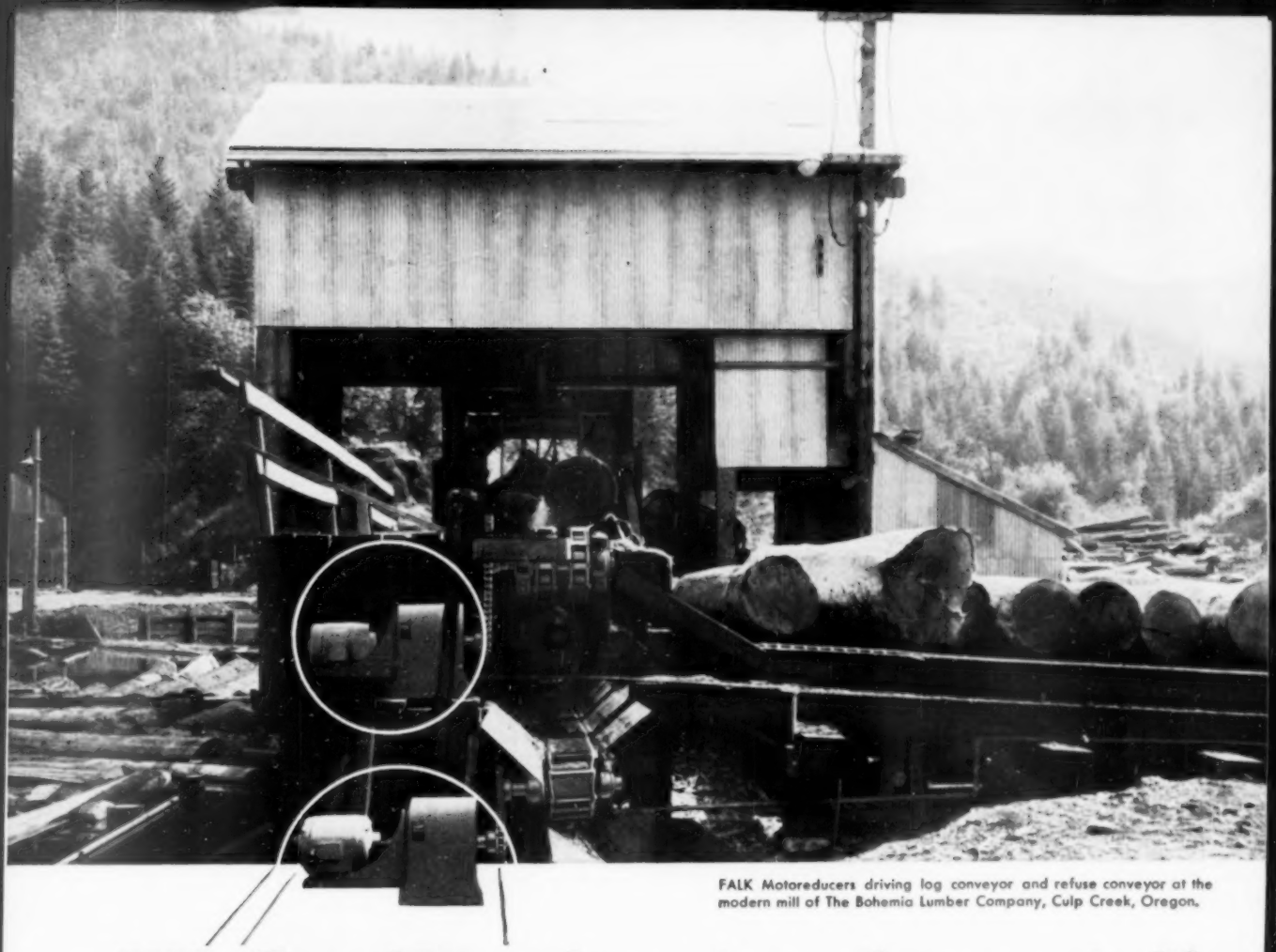
106—Spark-Plug Tester works electronically while engine is running to spot lead fouling—cause of 85% of plug failures. "ACilloscope" also detects electrode wear, oil and gas fouling, cracked insulators. Connects to 6- or 12-v. battery. Weighs 2½ lb. *General Motors Corp.*



107—Polaroid Film Holder attachment, for line of 5M and 6M projectors, produces quality 4x5 prints in 60 sec. after exposure without darkroom. Uses dry process. For quality production control, direct measurement on film can be held to ±0.001 in. *Stocker & Yale, Inc.*

108—Power Saw does anything that hand saw can do. Blade, mounted on rigid backing, cuts on forward and return strokes to provide 8000 strokes per min. No kick or pull. No foot or table needed. Blade stops about 1½ sec. after releasing trigger. *Wells Mfg. Corp.*

Turn the page



FALK Motoreducers driving log conveyor and refuse conveyor at the modern mill of The Bohemia Lumber Company, Culp Creek, Oregon.

FALK *all-steel* Motoreducers give you longer service life

Whether your load conditions are normal or heavy, the extra rigidity of all-steel construction (more than twice that of cast iron) maintains better alignment of revolving elements under load...a vital factor in prolonging the service life of gears and bearings.

And if your installations are subject to shock loads, or accidental external impacts, you're way ahead when you install Falk All-Steel Motoreducers. These rugged units do not destroy themselves by tearing off their feet under jamming overloads, nor are their housings subject to cracks which both dissipate the vital lubricant supply and allow revolving elements to get out of alignment.

All-steel construction is one of the built-in extras that you get in Falk Motoreducers. Others include: (1) 12 to 15% reserve load-carrying capacity in the gears (by AGMA standards), thanks to exclusive Falk extra-depth, high pressure angle helical gears; (2) maximum mechanical efficiency (98½% per gear mesh, under full load); (3) your choice of standard units (horizontal, vertical or right angle) to fit your precise requirements.

HORSEPOWER RANGE: to 75 hp . . . STANDARD OUTPUT SPEEDS: 780 rpm (high) to 1.2 rpm (low).

Prompt delivery from distributor stocks, or from warehouse or factory. Ask your Falk Representative or Authorized Falk Distributor for ***Bulletin 3100.***

THE FALK CORPORATION, MILWAUKEE 1, WIS.

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives and Distributors in most principal cities

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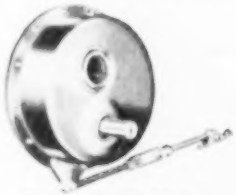
FALK

...a good name in industry

Take your choice of all-steel drives when you specify Falk

THE FALK ALL-MOTOR MOTOREDUCER
...the original All-Motor unit



THE ALL-STEEL FALK SHAFT MOUNTED DRIVE

Torque ratings to 41,000 lb-in at low speed shaft. Also available in flange-mount design.

FALK and ALL MOTOR are Registered Trademarks.

For more about these items, circle numbers on Reader Service Card next to back cover.

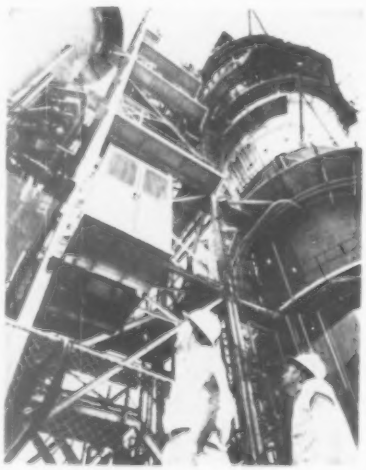
One-Man System Protects Plant

Only thing human about this "peeping Tom" system is the guard sitting before the closed-circuit TV screen. He monitors this plant surveillance system from master panel which replaces battery of human guards on constant patrol. This electronic watchdog detects fires, "sees" unauthorized people trying to sneak into grounds, spots sneak thief hiding in building to loot after hours. When a disturbance occurs, guard at controls is warned by audible signal and by lighted switches. He glances at sub-station panel to pinpoint trouble area. If it's an intruder, he may listen and/or speak to person in violated area through two-way intercom unit.

TV cameras "watch" authorized entry points at plant gates. Persons seeking entry must identify themselves on console screen before guard admits them. "Eyes" and "ears" of system are network of remotely located detection devices linked to nerve center. *Minneapolis-Honeywell.* (Circle 109).

Safe Transportation Where You Need It

Here's an elevator for eight men (or 2000 lb.) that can be assembled or dismantled in a few hours. It's ideal for maintenance and construction jobs. Does away with ladders, scaffolds, stairways. Has new-type traction drive. Doesn't need counterweight or other dead weights suspended on cable to maintain driving friction. This eliminates cable equalizing problems with heights over 250 ft. Operates on vertical monorail, made up of 10-ft. "H" beam sections. Safety locking device automatically stops elevator within ¼ in. in case cable stretches abnormally or breaks. *Hawkeye Products Corp.* (Circle 110).



111—Automatic Suspension Scale is calibrated with certified test weights to accuracy of 1/10 of 1%. Has highly legible 16-in.-dia. dial; adjustment to cancel out weight of slings, pallets, or chains. In capacities from 0-250 to 0-10,000 lb. Portable. *W. C. Dillon & Co.*

112—Pressure Washer delivers up to 3 gpm. of detergent water at 150 psi. with gun, to clean coils, filters, etc. No need to dismantle equipment; overhead space heaters flushed while in position. Rubberized bags and run-off sleeves catch dirty water. *Pressure Wash Mfg.*

113—Plastic Spray Unit puts corrosion-resistant coating on metal parts quickly, economically. Rolls to point of use. Uses polyethylene or nylon power to coat up to 3/16 in. thick. Comes with aluminum alloy spray gun fitted with needle control valves. *American Agile Corp.*

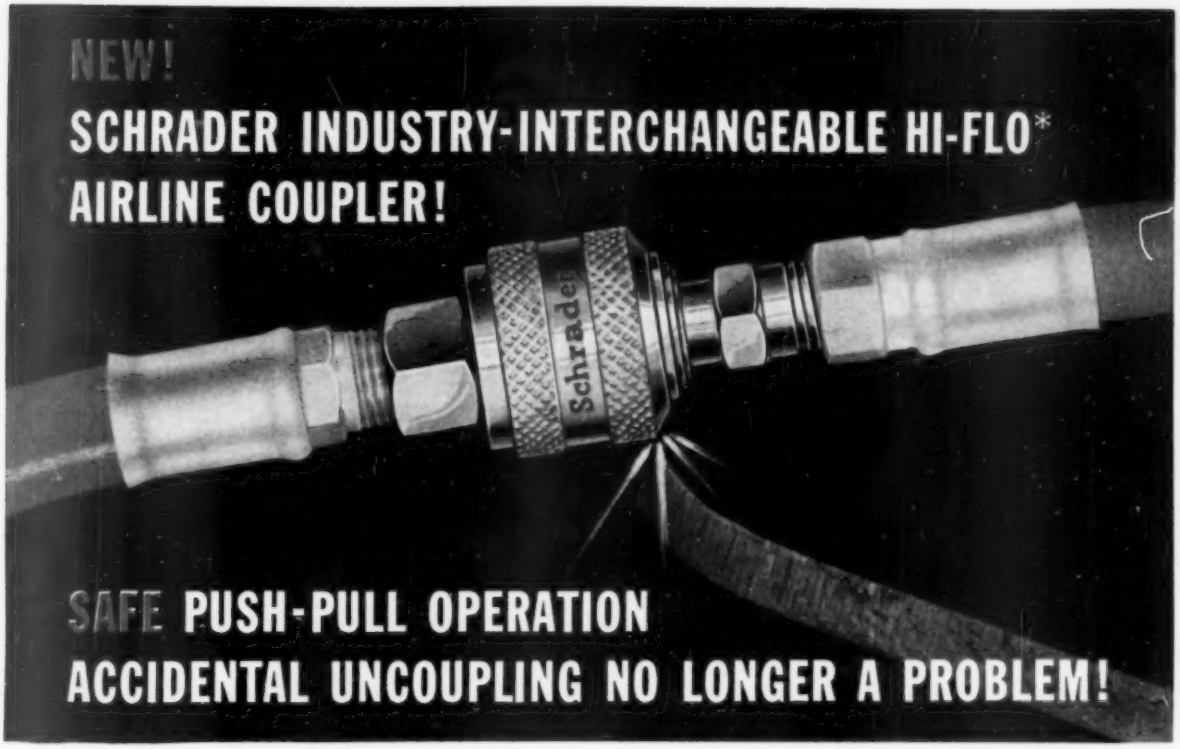
114—Concrete Drill chews a close-fitting hole and leaves steel expansion shell in it to provide permanent threaded anchor for bolt. Bolt cannot rust, melt out, creep, or vibrate loose from concrete. No need for preset inserts, powder charge pins. *Phillips Drill Co.*

115—High-Lift Crane, for heavy or awkward loads, holds up to 750 lb. extended to 14 ft. Mast and brace telescope as one unit; raise up or down by hand winch on mast. Has 1250-lb. capacity with boom at 34 in., mast and brace retracted to 8 ft. 8 in. *Thern Machine Co.*

Turn the page

NEW!

SCHRADER INDUSTRY-INTERCHANGEABLE HI-FLO* AIRLINE COUPLER!



SAFE PUSH-PULL OPERATION
ACCIDENTAL UNCOUPLING NO LONGER A PROBLEM!

Schrader's new quick-acting couplers are full of features that afford the best air service. Safety's built in . . . it won't open accidentally even when dragged on the ground and snarled on a piece of machinery . . . yet the heavily knurled new coupler connects and disconnects in a single upstream push or pull with *one hand, gloved or greasy!*

More features: fastest air flow . . . non-corrosive . . . case hardened steel all through . . . meets and exceeds military specs . . . engineered for simple, easy replacement of parts in the field.

Important: Schrader's new coupler is interchangeable with others of similar type. A variety of end fitting styles are available. See your supplier soon.

NEW COUPLER CHECK UNITS AND ADAPTERS

#5139-12–¼ N.P., FEMALE

#5139-12–¼ N.P. MALE
#5140-12–⅜ N.P. MALE

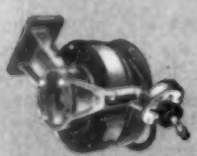
#5138-11–¼ N.P. MALE

#5139-11–¼ N.P. FEMALE

#5140-11–SERRATED SHANK FOR ⅜ I.D. HOSE

. . . added to these quality Schrader Accessories

SCHRADER HOSE REELS work like window shades. Tuck hose away automatically. No. 3481 is Air Tool Suspension Type.



SCHRADER LUB-AIR-ATOR does 3-way job: filters, lubricates, regulates. Keeps systems operating smoothly.

SCHRADER STANDARD COUPLERS WITH FASTER FLOW are now being shipped.

SCHRADER LEVER TYPE BLOW GUN offers precision control, from a gentle puff to a full blast.

SCHRADER BUTTON TYPE BLOW GUN is all-purpose, easy-operating, with durable forged brass body.

*Reg. U. S. Pat. Off.

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QUALITY AIR CONTROL PRODUCTS

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DODGE PRODUCTS you should know

TORQUE-ARM

America's most widely used shaft mounted speed reducers!

SC, SCM BALL BEARING PILLOW BLOCKS

Quality, for normal and medium duty!

TAPER-LOCK CHAIN COUPLINGS

No reboring — no waiting!

Write for Bulletins!

- Torque-Arm—55 models—complete data.
- Bearings—Ball and Roller.
- Chain Couplings and Sprockets.

DODGE MANUFACTURING CORPORATION
400 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

For more about these items, circle numbers on Reader Service Card next to back cover.

YOU HAVE TO BE STUPID TO BURN YOURSELF WITH THIS . . .

Ultra-Safe Bus Duct System

Yes, it's mighty difficult to stick a tool into live circuits with this electrical distribution system. Each contact point has a cover that opens only when plug-in component is in position to make contact.

System consists of 10-ft. or shorter lengths of "XL Bustribution duct." Easily installed, each length needs support only at 10-ft. intervals. Single bolt connects adjacent lengths. Plug-in box components have hook on right upper edge that grips top of duct casing during installation. No need for three hands!

Key on lower edge of plug-in fits into keyhole on duct. This automatically unlocks sliding door on duct, exposing contacts. Electrician then pushes box in.

Conductors are butyl-covered aluminum, but duct is available in copper. Duct has very low reactive voltage drop. Offers dead front maintenance, simple joints with few bolts. Available in 225 to 1000 amp., to 600 v. a-c, 2-, 3-, and 4-conductor; all standard fittings and plug-in components. *I-T-E Circuit Breaker Co.* (Circle 116).

0+2=1000 (New Photo Duplicating Method)

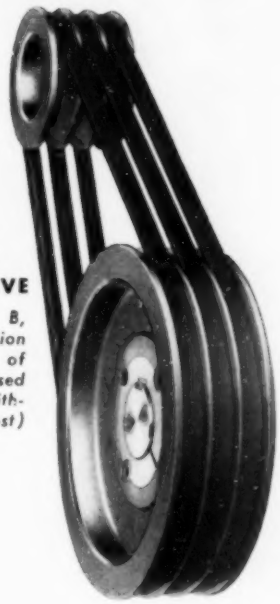
Perhaps it doesn't add up to you, but it does for the Ektalith photographic system. This new method, for large-volume operations, produces all types of written or printed documents. From an original (0), it makes an inexpensive paper master in two minutes (2) that turns out up to 1000 copies with standard offset equipment. Up to 10 copies can be made directly from master. *Eastman Kodak Co.* (Circle 117).

Turn the page

Announcing

an entirely new line of V-Belt Drives . . . . .

DODGE Dyna V



CONVENTIONAL TAPER-LOCK DRIVE

(— using standard A, B, C, D and E cross section belts, the hp ratings of which have been increased an average of 40% without any increase in cost)

DYNA-V TAPER-LOCK DRIVE

NEW HIGH CAPACITY

NEW COMPACTNESS

NEW SAVINGS IN COST

COMPARISON, ILLUSTRATED ABOVE — 3 HP, 1750 RPM, 2.41 TO 1 RATIO

	BELTS		SHEAVES			CENTER DISTANCE	HP	WEIGHT (LBS.)	COST	
	Number	Size	O.D. Driver	O.D. Driven	Width				Per hp	Per Drive
CONVENTIONAL TAPER-LOCK DRIVE	3	A42	4.15"	8.95"	2½"	12.3"	4.62	24.7	$5.62	$25.98
DYNA-V TAPER-LOCK DRIVE	2	3V400	3.35"	8.00"	1$\frac{3}{32}$"	10.8"	5.0	18.0	$4.50	$22.50
% SAVING *Savings vary with different sized drives*			**19%**	**10%**	**56%**	**12%**	+	**27%**	**19.9%**	**13.4%**

Dyna-V Drives are sensationally compact. They are capable of handling up to three times as much horsepower in a given space. Dyna-V opens vast new possibilities for better, more economical machine design. And, in most instances, *Dyna-V costs less!*

Narrower grooves, to match stronger, narrower Dyna-V Belts, greatly reduce the face width and the weight of Dyna-V Sheaves. Cost is lowered. Smaller diameter sheaves and shorter center distances multiply savings.

Dyna-V Sheaves decrease shaft overhang—increase bearing life. The new dimensional stability of Dyna-V Belts solves the problem of belt matching. Every belt carries its full share of the load.

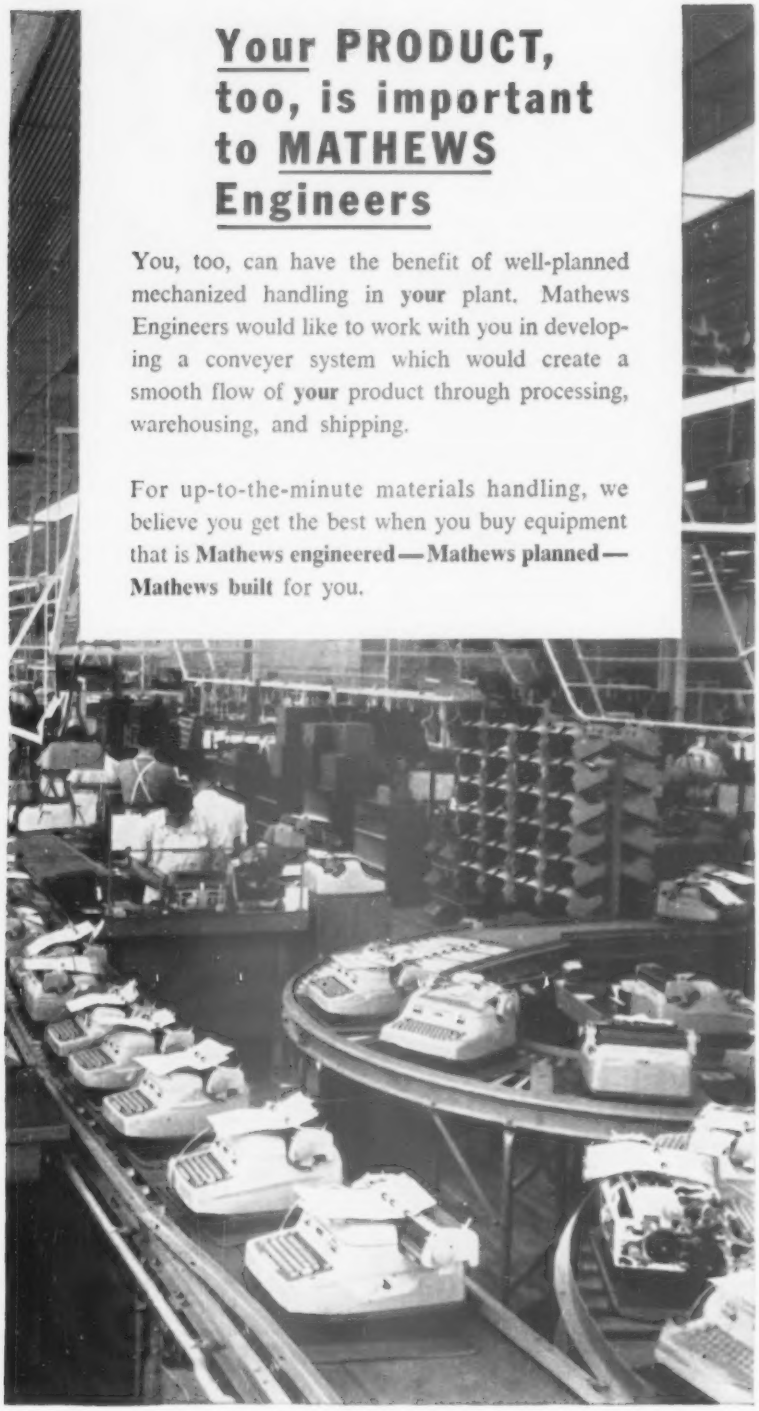
Dyna-V Drives are available for capacities from 1 to 1500 hp. Ask your Dodge Distributor. Or write us for new Dyna-V Bulletin.

DODGE MANUFACTURING CORPORATION, 400 Union St., Mishawaka, Indiana

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."



Your PRODUCT, too, is important to MATHEWS Engineers

You, too, can have the benefit of well-planned mechanized handling in **your** plant. Mathews Engineers would like to work with you in developing a conveyer system which would create a smooth flow of **your** product through processing, warehousing, and shipping.

For up-to-the-minute materials handling, we believe you get the best when you buy equipment that is **Mathews engineered — Mathews planned — Mathews built** for you.

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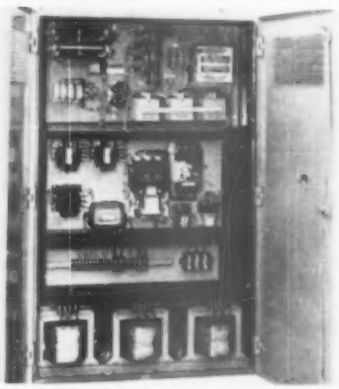
MATHEWS

Over Fifty Years of Leadership in Mechanized Handling

For more about these items, circle item numbers on Reader Service Card next to back cover.

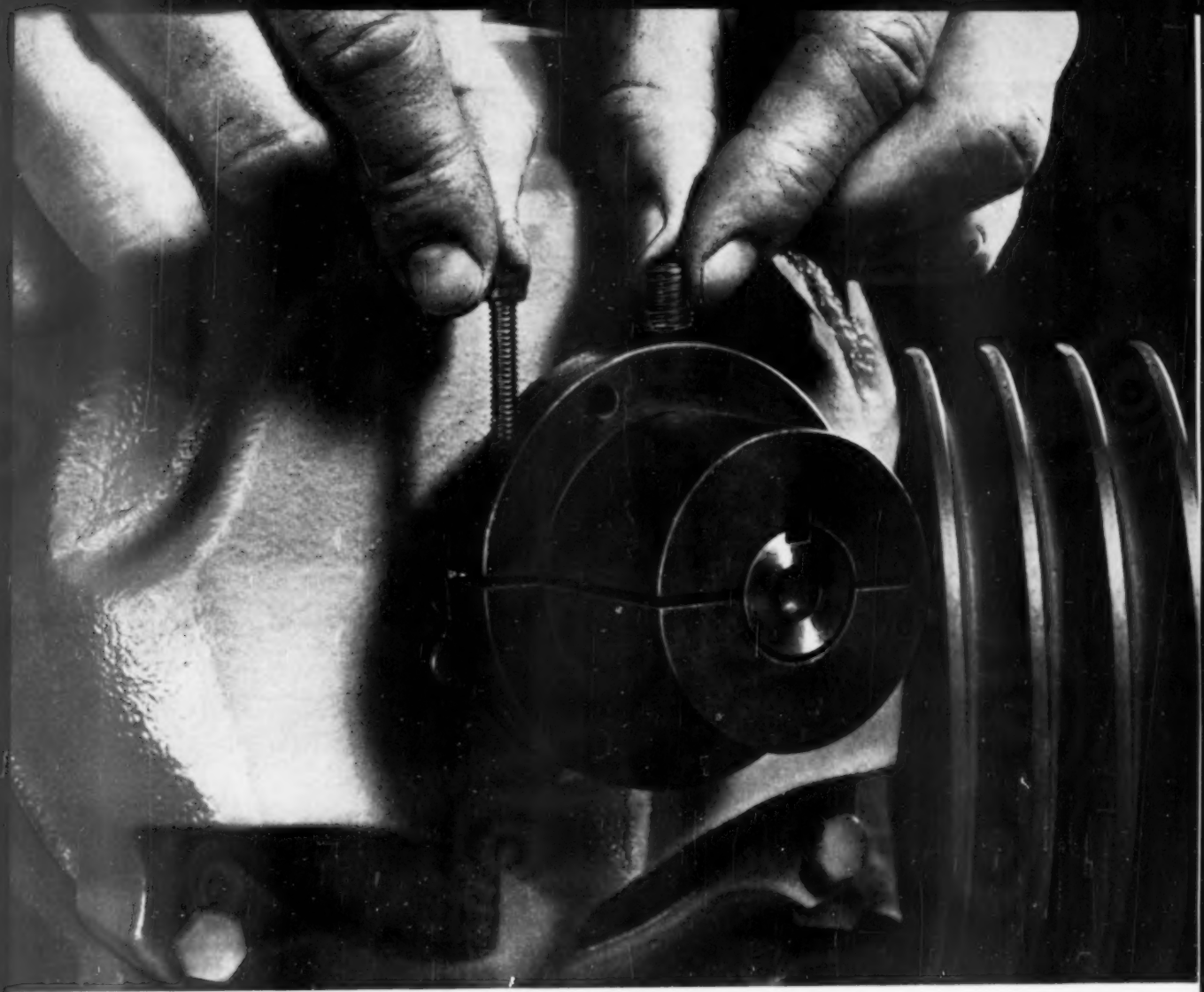
118—"Touch'n Hold" tool is a wrench worn like a ring on the finger to hold nut or bolt firm for assembly or disassembly. Permits reaching snug, remote, or hidden working areas. Adjusts to different finger sizes. In most popular hex-head nut sizes. *Beaver Tool Co.*

119—Proximity Limit Switch, for ferrous material, needs no power input, costs less to install and maintain. No transistors, tubes, coils, relays, or amplifier. Impervious to coolants, abrasive dust, dirt, or temperatures from −50 to +250 F. *General Equipment & Mfg. Co.*



120—Variable-Voltage Power Supply provides all-static control for d-c motors (1-200 hp.). Gives constant torque over 8:1 speed range. Above half speed it's 70 to 83% efficient. Uses no d-c contactor. Can use 3-phase 208/220 or 440 volts. *Westinghouse Electric Corp.*

Turn the page



Announcing Worthington QD Sheaves with the

GOLDEN SCREWS

To demonstrate to you that the exclusive two-screw design is practically worth its weight in gold, all Worthington QD (Quick Detachable) sheaves now have two golden screws.

The clamp screw simplifies installation and assures permanent alignment. You can install QD sheaves one part at a time. No heavy rim and hub combination to delicately inch into place. You just slide the hub on the shaft and permanently lock it in position with the clamp screw. Then you slide the sheave rim into position on the hub. This job is simplified because you engage the large end of the sheave with the small end of the hub. To change speed you simply install another sheave on the hub which remains anchored to the shaft by the clamp screw.

The set screw prevents "key drift." It locks the key securely in place, avoiding the danger of the key drifting off and becoming a safety hazard. This feature is appreciated by plant operators who first brought this potential danger to Worthington's attention.

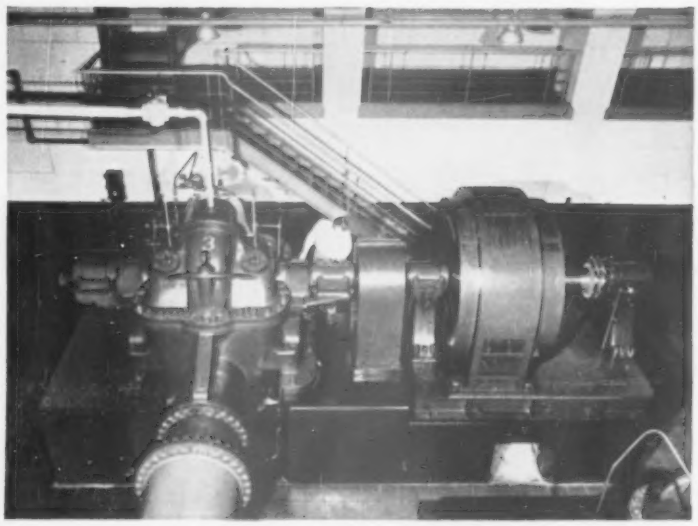
You tighten the set screw without distorting the hub. The clamp screw allows you to locate the hub on the shaft. The locked hub then permits you to tighten set screw on key without distortion.

You can get Worthington QD sheaves anywhere in the U.S. More than 350 distributors carry Worthington sheaves and Worthington-Goodyear Green Seal V-belts. For your copy of a 100-page Multi-V-Drive Manual on how to select the right sheave and V-belt write to Worthington Corporation, Section 79-15, Oil City, Pennsylvania. In Canada: Worthington (Canada) Ltd., Brantford, Ontario.

WORTHINGTON

For more facts Circle 485 on Reader Service Card

A case for F-M Split-Case Centrifugals!



Typical installation in Toledo averages 80.314% wire-to-water efficiency for year!

Exceptionally high and dependable efficiency with steady, low-cost operation year after year—that's the report from a host of municipalities and industries using Fairbanks-Morse pumps in their pumping stations.

Why? Ask stations like Collins Park High Service in Toledo, O., where five Fairbanks-Morse 36-in. Split-Case Centrifugal Pumps have been giving superb performance for 17 years. The No. 3 pump in the photo pumped 6,065,590,000 gallons in one year alone, handling 26.13 percent of the plant total, and consuming just 3.55 kilowatts hours per million foot gallons!

Your Fairbanks-Morse Field Engineer welcomes you to inspect many other reports like this from his files—reports revealing why no other manufacturer can match the experience of Fairbanks-Morse in providing pumps and drivers for both municipality and industry. Your F-M Field Engineer will be glad to work with your own engineers in selecting the best equipment for your specific requirements. Write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

See Sweet's Product Design Catalog File for complete F-M Pump Line.

FAIRBANKS-MORSE
a name worth remembering when you want the BEST

PUMPS • SCALES • ELECTRIC MOTORS • DIESEL, DUAL FUEL AND GAS ENGINES
LOCOMOTIVES • COMPRESSORS • GENERATORS • MAGNETOS • HOME WATER SYSTEMS

For more facts Circle 486 on Reader Service Card

FACTORY / EQUIPMENT NEWS

Begins on page 78

For more about these items, circle item numbers on Reader Service Card next to back cover.

121—"Scru-Drill" is combination drill and power screwdriver that converts from one to other by turn of spindle collar. Can be used with twist drills to ⅜ in., wood augers to ¾ in., masonry bits to ½ in., hole saws from ⅝ to 1¾ in. *Black & Decker Mfg. Co.*

122—Electronic Gage measures pressure exerted by electrodes of resistance welders. Compact, it has transistorized amplifier, power supply from two small replaceable dry-cell batteries, panel controls for checking batteries and for calibration. *Control Devices, Inc.*

123—Fork Truck Attachment retrieves load-carrying sheets used in palletless handling by either pulling sheet from under its load or pushing load off sheet. It's done with gripper jaw and pusher rack that act simultaneously or independently of each other. *Clark Equipment Co.*

Turn the page

first in silicones

Dow Corning

SILICONE NEWS

production and maintenance edition • No. 32

POWER WHERE YOU NEED IT

If your plant requires transformers that are light, compact, easy to install close to load, quiet and above all, reliable, here's a design that fills the bill.

Among the latest contributions from Westinghouse toward better electrical equipment are its DT-3 (three phase) and DS-3 (single phase) dry-type transformers.

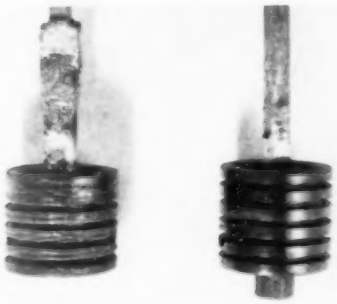
Combining insulation made from Dow Corning Silicones with Hipersil grain oriented steel to cut size and weight, these transformers are 25 to 51% smaller, 17 to 32% lighter than previous 80°C rise units. What makes these size and weight savings possible? Insulation systems made with Dow Corning silicone materials are more thermally stable, permit copper and iron to work harder . . . design-temperature rise can be boosted to 150°C. This heat resistance assures more power per pound.

An important feature of these units is quietness. Designed for today's low sound level requirements, the DT-3 and DS-3 line of equipment is designed to test below 45 DB on units 150 Kva and smaller . . . 50 DB on units of higher kva.

Many installations have already proved the value of these silicone insulated units. For example, St. Luke's Hospital in Phoenix has installed Westinghouse DS-3 single phase transformers in new surgical X-ray rooms because of the dependable silent service they offer. In this particular installation, a decibel meter placed on the transformer case resulted in no reading at all on the 40 DB scale.

Again, at C. F. Hathaway Shirt Company, DT-3 installations are drawing applause. Hathaway's Superintendent of Maintenance says:

"These small, lightweight transformers were easily suspended from the ceiling by ⅝" steel rods. This, together with their low sound level, allowed us to place them next to the machines they supply, keeping line losses to a minimum and giving us maximum performance and system efficiency." **No. 747**

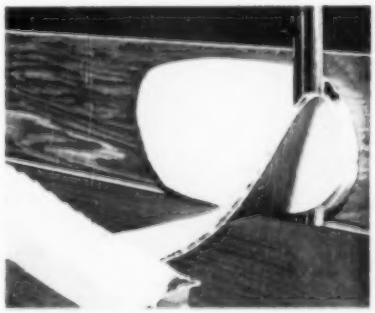


WHY THE DIFFERENCE?

Each plunger shown above has been in use for two years under similar conditions. The one on the left has molten metal built up on its shaft and its collars are damaged. But the one on the right still looks new. Why?

The plungers, part of type casting machines used by the New York Times, are continually suspended in a bath of molten metal that's 550 F. In casting type lines, the plungers feed metal into a chamber and a line of type, called a "slug", is made. If unlubricated, the plungers make trouble. Metal builds up quickly on the shaft, the collars become eroded, the corners rounded. Result: faulty "slugs."

About two years ago, the Times' Chief Machinist and Chemist figured out a simple solution. It's Dow Corning silicone fluid, rubbed on the plungers twice a week. They found that the silicone prevents molten metal from accumulating on the plungers, keeping them in perfect working order for years. The plunger at right is evidence. Only silicone fluids can do the job because only silicones have sufficient heat resistance. Chances are good that silicones could aid your molding, too. **No. 748**

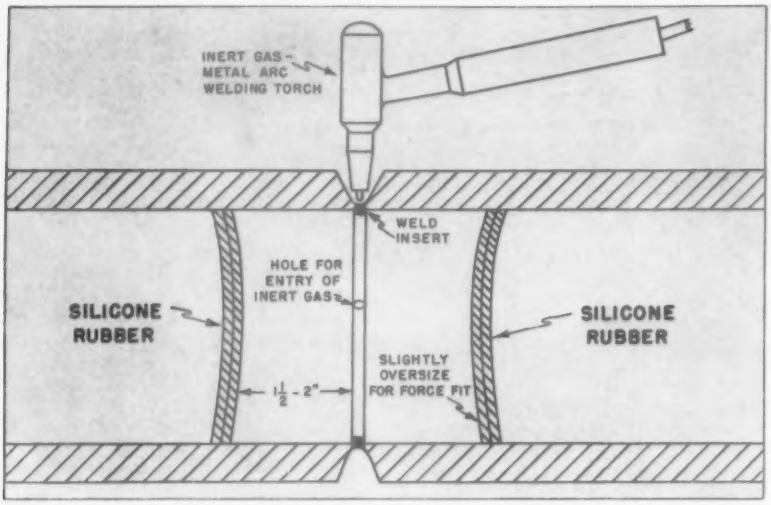


A Well-Oiled Blade

The Frank Edge Saw Manufacturing Co., Grand Rapids, Mich., offers a special cutting machine that cuts foam rubber, polyurethane foam, cellulose sponge, Styrofoam and like materials. A patented serrated blade plus stripper *(Cont. Pg. 2)*

FOR DATA RELATING TO THESE ARTICLES, CIRCLE REFERENCE NUMBER IN COUPON ON NEXT PAGE OR REFERENCE NUMBER ON READER SERVICE CARD

MORE



NEW TRICK FOR WELDING PIPE

Though this story concerns the welding of alloy steel pipe, the ideas contained have broader significance. It's a prime example of industry's ingenuity in saving production money with a versatile new material.

At the Richmond Refinery of Standard Oil of California, plant engineers wanted an economical way to weld stainless steel pipe. The welding technique used was an inert gas-metal arc process. Problem: Surrounding the inside of the weld with inert gas so the weld wouldn't oxidize. Purging the entire length of pipe was one solution, but an expensive one. The idea they came up with was to dam the pipe close to the weld area. Fine idea. Now they needed a heat resistant and resilient material to meet the requirements.

They found it in Silastic®, the Dow Corning silicone rubber. Why not ordinary rubber? It decomposes at the temperatures involved . . . gives off smoke and may possibly contaminate the weld. Silastic, on the other hand, resists over 500 F; remains intact even when placed as little as 1½" from the weld.

Each dam is made of two pieces cut from ⅛" sheet Silastic, sewn together for greater stiffness. The dams are slightly oversize to permit a force fit, as shown in diagram. After welding, the pipe is stress-relieved in a heat-treating furnace. This burns the Silastic to silica ash, an inert, non-contaminating material. Pipe up to 3" diameter has been thus welded at the Standard Oil refinery, and plant men believe their technique would work on sizes up to 8".

Is there a part of your process that could be aided by this material that stays rubbery from —130 to over 500 F? *No. 749*

SILICONE *(Continued)*

guides enable the machine to cut at angles, horizontally or vertically.

In sawing these sometimes-stubborn materials, the stripper guides require a durable lubricant to prevent build-up. Frank Edge Saw tried a variety of lubricants. Some hardened in cold weather, others simply failed to lubricate well enough. But one worked perfectly . . . a Dow Corning silicone fluid. Silicone oils flow evenly at any temperature from far below zero to 300 F. Being inert, they can't contaminate or harm materials they contact.

The Frank Edge Saw Co. was so pleased, they now include silicone fluid as "standard equipment" with all saws and recommend it to all saw purchasers. *No. 750*

new literature and technical data on silicones

A Case Study — A reprint from Electrical Construction and Maintenance tells how rugged production conditions caused moisture to penetrate coil insulation on a welding transformer. Repair costs were running more than $2000 per failure until Dow Corning silicone insulation materials were applied. The advantages of silicone insulation and its step-by-step installation are illustrated in this 4-page reprint. *No. 751*

Don't Lose Time — practical tips on the maintenance and cleaning of shell molding patterns are printed in three-hole punched data sheet form. Prevention of sand or resin build-up and prevention of release agent build-up are discussed in: *No. 752*

Silicones In Industrial Finishes is the title of a new article reprinted from Products Finishing. Silicone coatings have become well known for their resistance to corrosion, and this 4 page article discusses various formulations and the applications to which they are best suited. Important reference for the production or maintenance man interested in surface finishes. *No. 753*

Production Needn't Suffer because of a hard to replace rubber seal or gasket. When such parts are not stock items, down-time can be slashed by using Silastic® RTV, the Dow Corning silicone rubber that vulcanizes in just a few hours at room temperature. An illustrated data sheet tells how Silastic RTV can be poured in place to form built-in gaskets for the rims of lids, covers, or oven doors, or shows how simple molds fashioned from wax, wood, soap or other easily worked materials can enable you to make gaskets of any size or configuration. *No. 754*

Wherever Dissimilar Metals are in contact, a new silicone compound will help prevent galvanic corrosion. In addition, this compound offers the excellent thermal stability and moisture repellency normally associated with silicones. A concise data sheet describes the performance of this new product. *No. 755*

Dow Corning Corporation, Dept. 5124, Midland, Michigan
Please send me: 747 748 749 750 751 752 753 754 755

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE ____ STATE _____

SILICONE NEWS is published for production and maintenance men by

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

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Get new-forging performance at 1/3 the cost from ERIE FOUNDRY REBUILDING SERVICE

Here at the Erie Foundry Rebuilding "Hospital", we disassemble and inspect your forging hammer, remachine worn surfaces, true bearings, replace broken parts, repair cracked parts. Once the hammer is reassembled, tested and put back in operation, it'll be as spry and sound as a new machine—but at one-third the cost!

Stands to reason that the leaders in forge manufacture for over 60 years should be the best source for forge repair.

Regardless of who made it, or how badly it's cracked, broken or worn, your forging hammer will recover most quickly at Erie Foundry's Rebuilding "Hospital". Write for the complete story.

ERIE

THE WORLD'S GREATEST NAME IN FORGING SINCE 1895

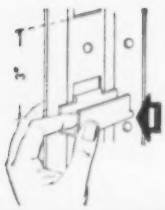
ERIE FOUNDRY CO.
ERIE 2, PA.

For more facts Circle 487 on Reader Service Card

if a woman went shopping for shelving she would buy

BORROUGHS STEEL SHELVING

A man may not agree with his wife on everything, but most men will admit that when it comes to shopping, the "little woman" knows value. Now, if she were shopping for shelving, she would naturally choose shelving that gave the most for the money. And that's Borroughs Steel Shelving in a nutshell . . . the most simple, most flexible, most rapidly assembled shelving on the market, with the exclusive Borroughs Shelf Support Brackets that make installing or rearranging shelves an A-B-C operation. And remember . . . except for the top shelf (2 nuts and 2 bolts), no other nuts or bolts are required for shelves—no special tools are needed to assemble units—each individual unit is complete in itself—any unit or shelf can be moved independently. Send for more details now.



Insert 4 shelf support brackets . . no fumbling with studs, bolts, nuts or lock washers.

and then

Tilt shelf into support brackets . . . and shelf is ready for loading.

BORROUGHS MANUFACTURING COMPANY
OF KALAMAZOO
A SUBSIDIARY OF THE AMERICAN METAL PRODUCTS COMPANY OF DETROIT
3020 NORTH BURDICK ST. amp KALAMAZOO, MICHIGAN

send for catalog
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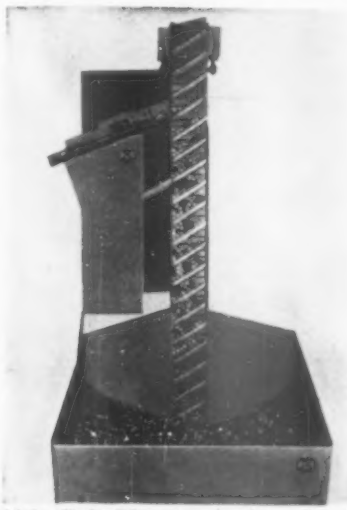
FACTORY / EQUIPMENT NEWS

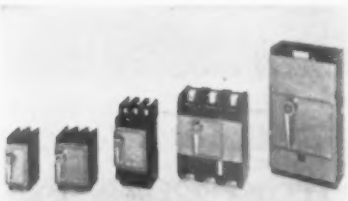
Begins on page 78

For more about these items, circle item numbers on Reader Service Card next to back cover.



124—Belt Elevator feeds and orients parts from a 15-cu.-ft. hopper to production or assembly machines. At discharge chute, with adjustable height and right or left outlet, parts roll or slide. Variable speed drive, optional "demand-feed" control. *Radio Corp. of America.*

125—Cold Generator, for processing and cooling, is hermetically sealed and powered by low-pressure steam. Uses water as refrigerant, lithium bromide as absorbent. In 100- to 350-ton capacities for single or multiple units. Single shell design. *The Trane Co.*



126—Circuit Breakers, complete line, have rotary operating handle as integral part. No external linkage, thus no handle misalignment or false indication of breaker contact position. In 15-100 amp. 480-v., to 125-800 amp. 600-v. units *Federal Pacific Electric Co.*

Turn the page

For more facts Circle 488 on Reader Service Card

For more facts Circle 489 on Reader Service Card ➤

Chemical energy provides direct current

Power is furnished by a fuel cell in the Allis-Chalmers Research Laboratories. It points the way to remarkably efficient means of energy conversion in the future.

Unlike the conventional storage battery, the fuel cell converts the chemical energy of gases (at room temperature) directly into direct current. For the future the fuel cell promises a highly efficient source of power.

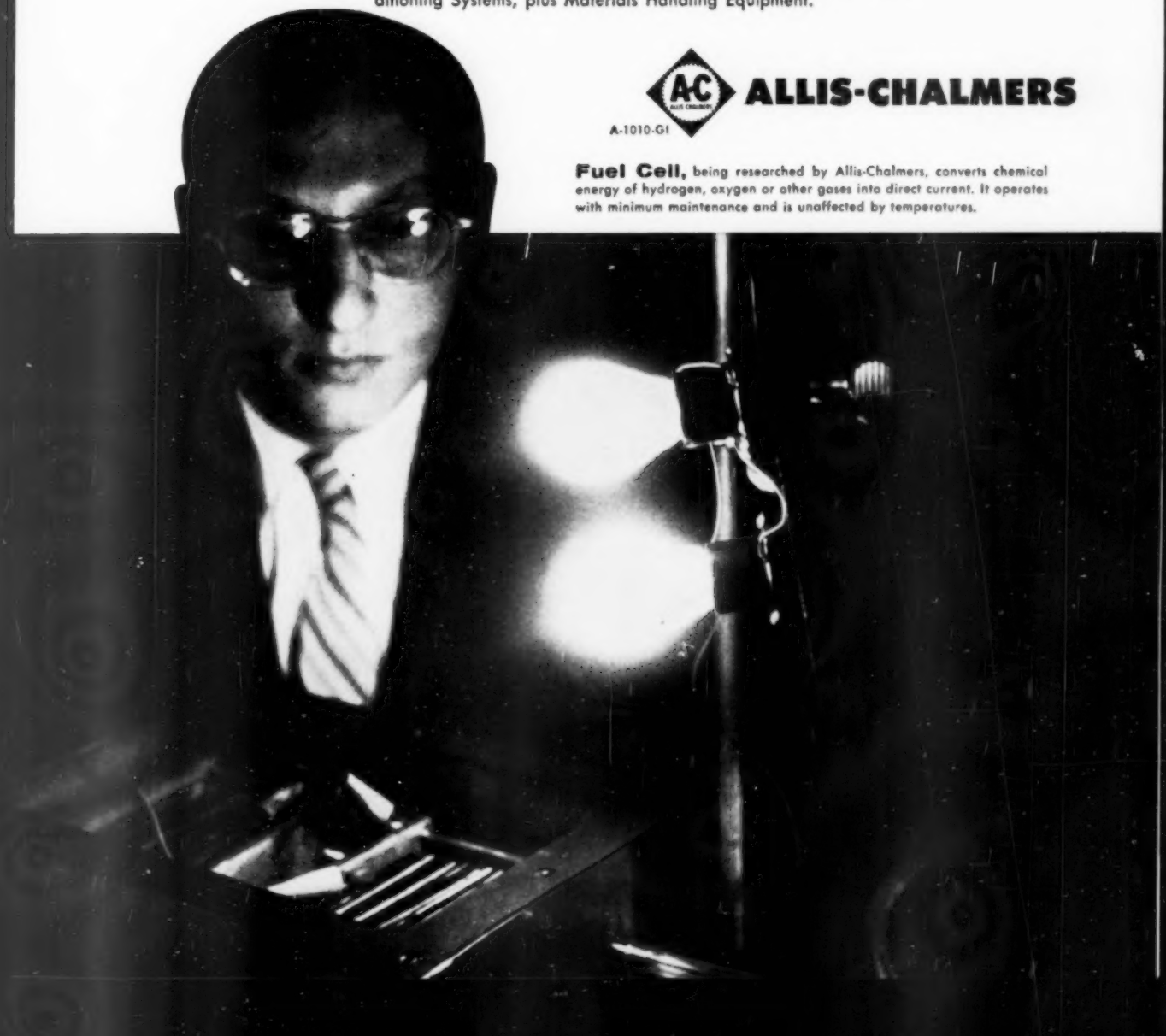
Fundamental research of this type serves *two* end results at Allis-Chalmers: 1) enables design engineers to make equipment even better; 2) helps every industry achieve new efficiencies and economies.

Research is only one area where A-C helps. Single-source availability of "teamed" equipment, maximum engineering assistance and outstanding service facilities are others. For more information, contact your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Products for Industry Electrical Generation, Distribution and Utilization Equipment; Pumps; Mechanical Power Transmission Equipment; Processing Machinery; Motors and Control; Water Conditioning Systems, plus Materials Handling Equipment.

A-C ALLIS-CHALMERS

A-1010-GI



Fuel Cell, being researched by Allis-Chalmers, converts chemical energy of hydrogen, oxygen or other gases into direct current. It operates with minimum maintenance and is unaffected by temperatures.

Minutes from Your New Plant in Tidewater Virginia

Enjoyable living is a significant factor involved in modern plant site selection. Above are two witnesses to the brand of living available in Tidewater Virginia — a plant just minutes from the matchless duck hunting of world-famed Back Bay. Executives, supervisors, and production employees all can take part in the opportunities of Tidewater . . . housing is abundant and inexpensive, living costs are low, and new residents are warmly welcomed.

Located at the center of the Eastern Seaboard, Tidewater Virginia has long been a vital industrial and commercial hub. Today it is growing at a rate 2½ times that of the nation. Tidewater Virginia is a good place for your new plant and for the men and women you will employ. For a confidential report on how we can meet your specific needs, contact:

Clarence H. Osthagen
Vice President and Executive Director

Tidewater Virginia Development Council

300 Boush Street Norfolk, Virginia

FACTORY / EQUIPMENT NEWS

Begins on page 78

For more about these items, circle item numbers on Reader Service Card next to back cover.

127—Emergency Oxygen "Back Pack" contains two cylinders in lightweight aluminum case. Strapped to his back, rescuer has both hands free to crawl, climb ladders, or remove débris. Dual head and face mask supplies oxygen to victim. *Chemetron Corp.*

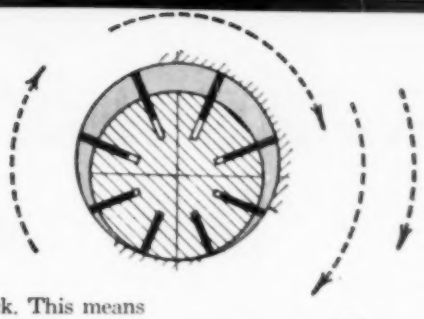
128—Two-Way Radio (115 v. a-c), using "citizens' band," has "squelch" circuit to block receiver noise for clear, positive contact up to several miles in noisy locations. Ability to reach around buildings and objects makes it ideal for field use. *Radio Corp. of America.*

129—Intercom System for small plants has seven pushbutton phone stations for directly calling an internal location. Any phone in system can communicate with another. Color code and wiring scheme reduces installation time and costs. *Tele-Norm Corp.*

Turn the page

For more facts Circle 490 on Reader Service Card For more facts Circle 491 on Reader Service Card ➤

Smooth and Tough



Rotary motion cuts vibration — eliminates shock. This means savings in maintenance and installation. That's why the story of the *Ro-Flo* compressor is important to you.

They're being used successfully on hundreds of applications including: air hoists, lifts, pneumatic tools, sandblasting, blowing castings, and air chucks.

Another advantage is constant efficiency. The fall-off in efficiency, inevitable with other units, never takes place with a *Ro-Flo* compressor.

For smoothness, for toughness, for simplest installation and easy maintenance, choose the *Ro-Flo* compressor.

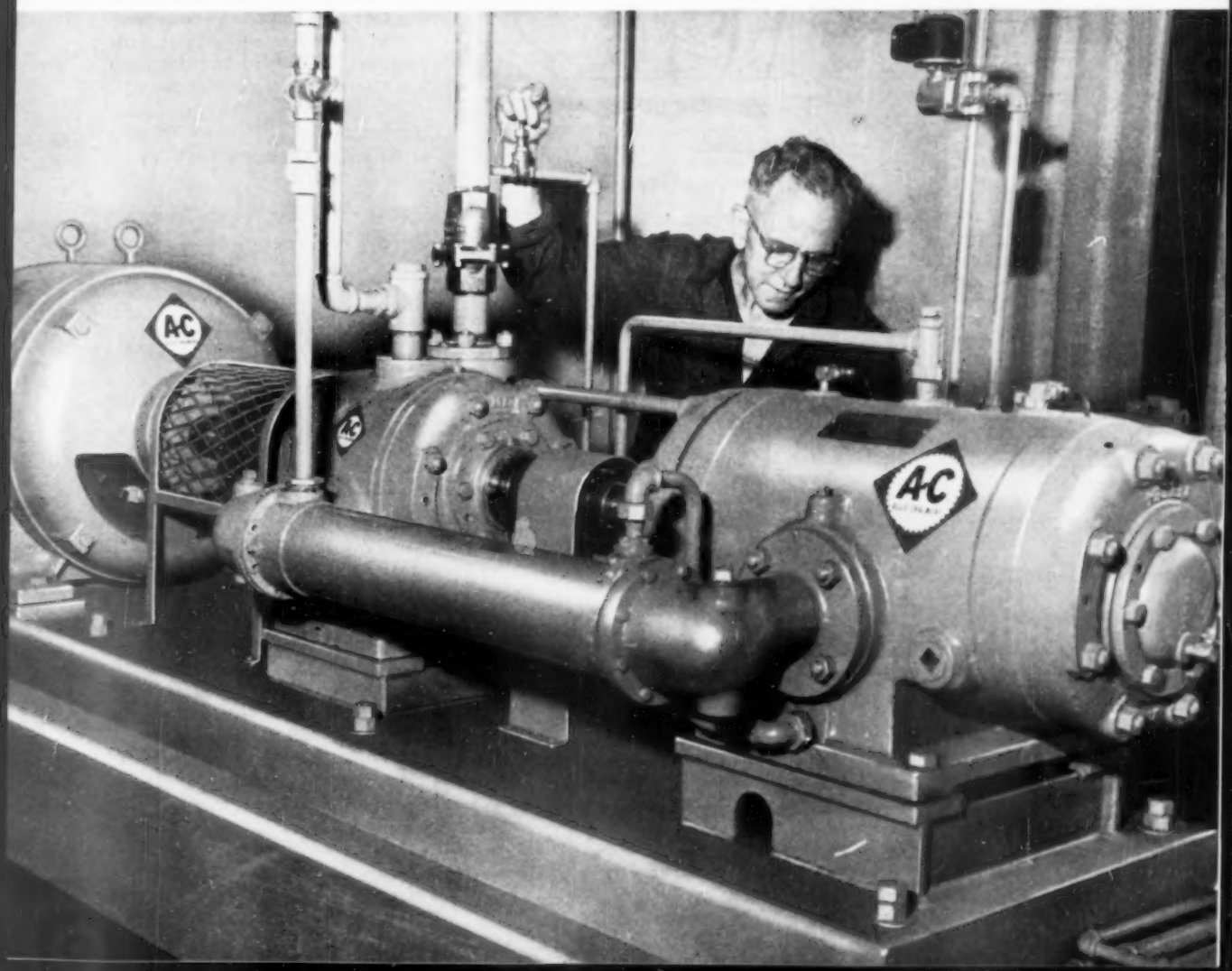
Get bulletins 16B8244 and 16B8126. Call your nearby A-C office or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

Ro-Flo is an Allis-Chalmers trademark.

Ratings: Pressures to 125 pounds gauge. Volumes 40 to 3000 cfm.

ALLIS-CHALMERS

A-5960-G1



The CASE of the "GHOST GANG" ROBBERIES

NEEDING ADDITIONAL WAREHOUSE SPACE, A LARGE EASTERN ELECTRICAL MANUFACTURING COMPANY LEASED FACILITIES NEAR ITS MAIN PLANT. IN SPITE OF PERIODIC CHECKS, VALUABLE EQUIPMENT DISAPPEARED REGULARLY FROM STORAGE AREAS AND LOADING DOCKS.

WHAT DO YOU MAKE OF IT, BILL? THIS IS THE FOURTH MISSING SHIPMENT IN A ROW!
LOOKS LIKE PROFESSIONALS, JIM—BUT I'VE GOT AN IDEA THAT MAY STOP THEM!
...SO, MR. ROBBINS, I THOUGHT THIS KIDDE "BLACK LIGHT" ALARM SYSTEM MIGHT BE THE ANSWER.
IT'S WORTH A TRY, BILL—I'LL CALL THEM TODAY.

LET'S GO, FELLOWS!
LOOKS LIKE YOUR TRAP HAS CAUGHT THE MICE, BILL!
BR-R-R
BR-R-R
O.K., YOU GUYS—REACH!
START LOADING THEM IN THE WAGON, BOYS!

Here's what Bill told the boss—

Kidde's new "black light" burglar alarm system provides tamper-proof photo-electric perimeter protection. Because it transmits a pulsating beam, it can't be jammed. And because it uses "black light," it can't be detected by thieves. The moment they break the beam, alarms sound. Best of all, this dependable Kidde protection is easy and inexpensive to install. Take a tip from Bill—find out more about Underwriters' Laboratories-approved "black light" protection. Write Kidde today.

Kidde

Kidde Ultrasonic & Detection Alarms, Inc.
1232 Brighton Road, Clifton, New Jersey
A Subsidiary of Walter Kidde & Company, Inc., Belleville 9, N. J.

FACTORY / EQUIPMENT NEWS

Begins on page 78

For more about these items, circle item numbers on Reader Service Card next to back cover.

130—Portable Stapler, of lightweight aluminum, has penetration control dial for eight depths, accuracy to within 1/32 in. Loose or tight clinch knob setting. Accepts two full clips (100 staples); reloading at minimum. Non-slip handle. *International Staple & Machine Co.*

131—D-C Arc Welder has separately controlled welding voltage and current. This allows deep penetration when wanted, without burn-through. Two models: 300 amp. has 60-amp. minimum at 20 v. to 375 amp. at 40 v.; 400 amp. has 80 amp. minimum at 20 v. to 500 amp. at 40 v. *A. O. Smith Corp.*

132—Air Staker performs pressing or staking operations independently or combined in rapid sequence. Result is quick, low-cost uniform assembly of small components such as cams, bushings, gears, shafts, plates. Tool change takes less than 15 sec. *Cramer Controls Corp.*

Turn the page

For more facts Circle 492 on Reader Service Card

For more facts Circle 493 on Reader Service Card ➤

You can save up to 20% on close-coupled pumps

Capacities to 2500 gpm, heads to 550 ft.

Now from Allis-Chalmers: Close-coupled pumping units powered by *Super-Seal* motors with *Poxeal* insulation!

You can save up to 20% by specifying these units. Reason: Open-type *Super-Seal* motors may be used in many areas previously requiring more costly enclosed motors.

In addition to moisture-defying *Super-Seal* motors, these pump units offer heavy-duty construction, easily replaceable wearing rings, balanced impellers, plus other quality pump features. It all adds up to a cost-saving pumping package for a wide variety of installations.

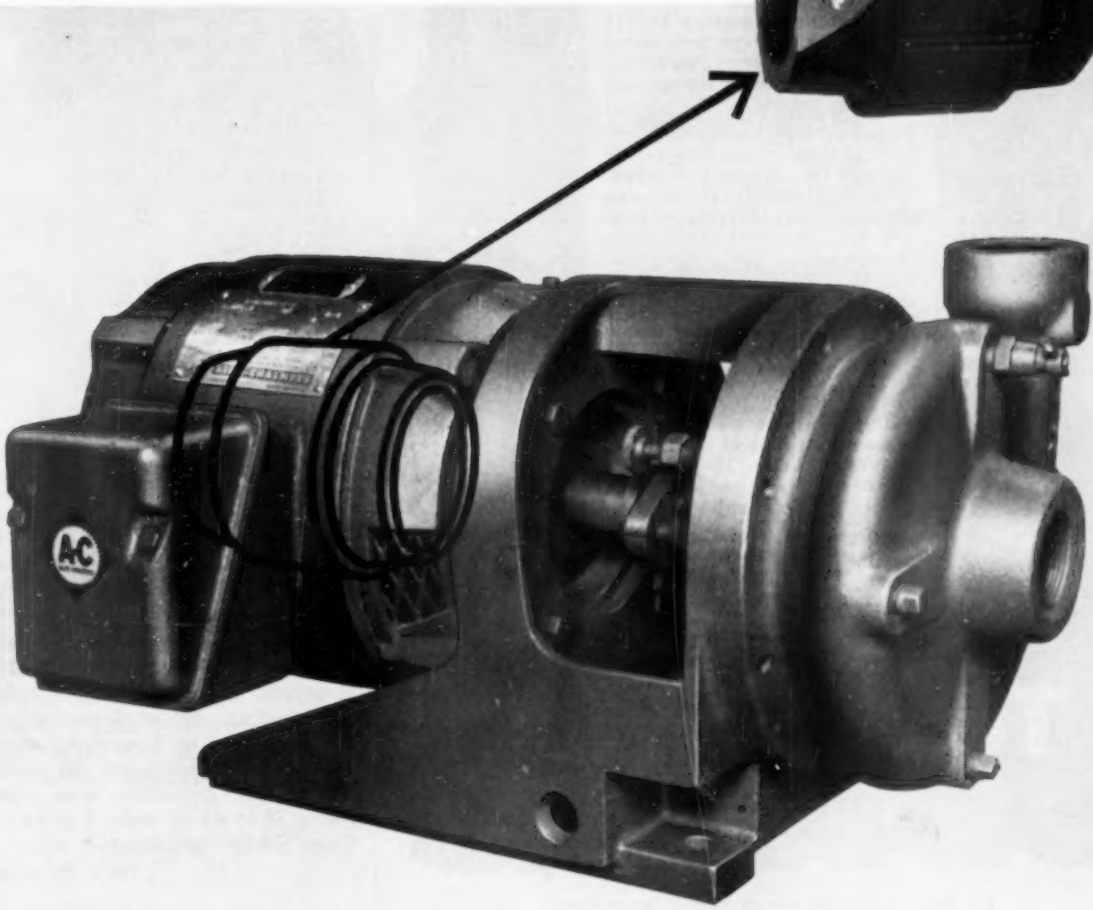
Contact your A-C representative or distributor for coordinated pumping equipment — pumps, motors, control and drive. *Or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.*

ALLIS-CHALMERS

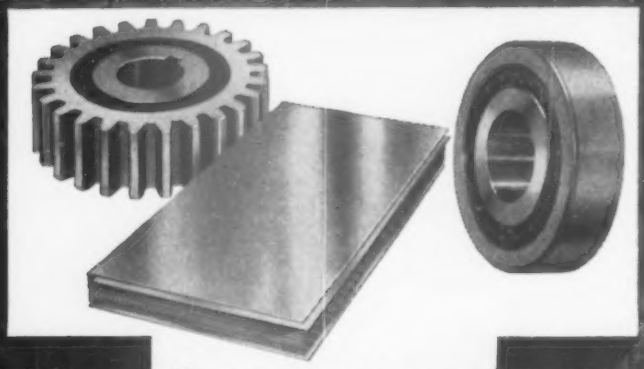
A-5883-G1

POXEAL insulation system of *Super-Seal* motors provides a stator completely impervious to contaminating elements. Result: A close-coupled pump with an open-type motor that can "take" the toughest atmospheres.

Super-Seal and Poxeal are Allis-Chalmers trademarks.



VALVOLINE
Tectyl
protects metals
against RUST



VALVOLINE'S amazing Tectyl rust preventives protect metal surfaces against *every kind of rust and corrosion* during storage and shipping.

Low-cost Tectyl compounds are easy to apply by brush, spray or dip and just as easy to remove. They protect metal surfaces against . . . sun and rain . . . heat and cold . . . salt air and salt water . . . humidity, perspiration and corrosive fumes.

Tectyl rust preventives meet exacting government specifications.

Write today for these two helpful Tectyl charts

1. "Valvoline Tectyl U. S. Government Approved Packaging and Preservative Chart." Gives the Army, Navy and Air Force "Specs" and applications.

2. "Valvoline Tectyl Industrial Rust Preventive Comparison Chart." Specifies applications covering the entire field.

VALVOLINE
Tectyl ALL-METAL PROTECTION RUST PREVENTIVES

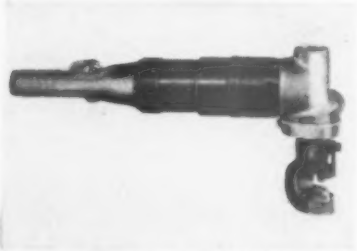
VALVOLINE OIL COMPANY, Freedom, Pennsylvania
Division of Ashland Oil & Refining Company

FACTORY / EQUIPMENT NEWS

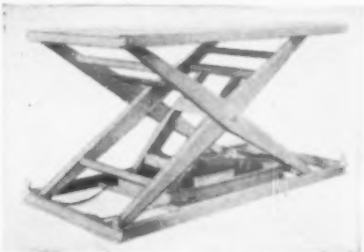
Begins on page 78

For more about these items, circle item numbers on Reader Service Card next to back cover.

133—Vacuum Pad Attachment, for fork-lift trucks, slips easily onto forks for fast, safe, economical handling of barrels, plate, sheet, or stone. Four 1-in. pads each have lifting capacity of 500 lb. For use individually, in combination, or all together. *Vac-U-Lift Co.*

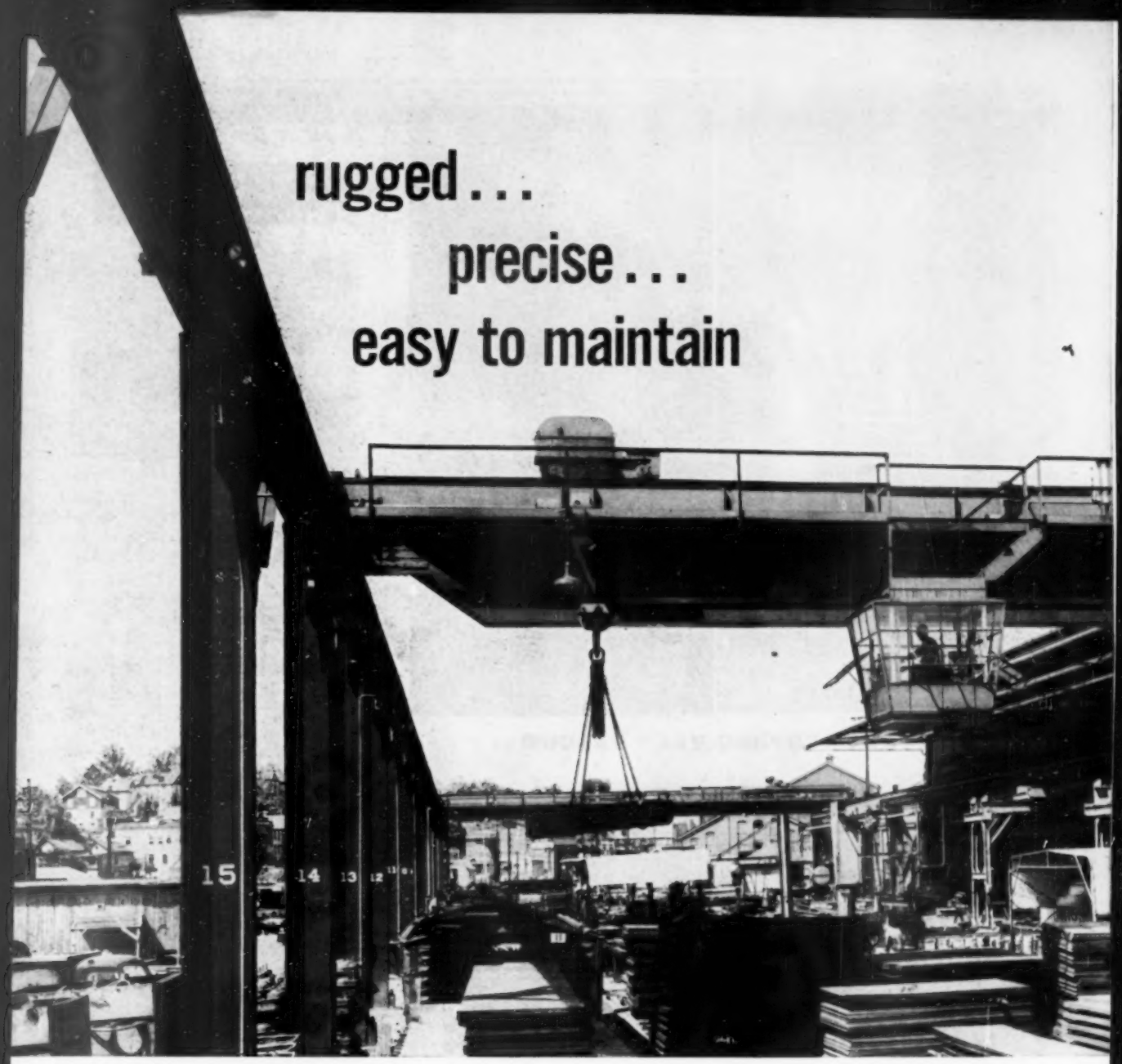


134—Heavy-Duty Nibbler, air-powered, cuts through No. 8 gage mild steel or No. 10 gage stainless at 6-ft.-per-min. rate, straight or in contour, without distorting. Portable; cuts sheets too large for stationary tools. Minimum cutting radius: 5 in. *Buckeye Tools Corp.*



135—Lift Table, hydraulically powered, simplifies lifting (to 60 in.), feeding, and work-positioning of long-bulky or large-light loads for process assembly, etc. In 1000- to 6000-lb. capacities, with platforms 38 to 65 in. wide, 7 to 16 ft. long. *Southworth Machine Co.*

Turn the page



Westinghouse crane control

Precision built to crane-duty standards . . . long-term, low-cost service with easy operation and low maintenance costs . . . the most complete line of magnetic crane control available . . . 'round-the-clock service facilities in all areas . . . all components service-proved . . . undivided responsibility from one supplier . . . just several of the reasons why you can count on dependable, more economical service from cranes equipped with Westinghouse control. Your nearby Westinghouse salesman has all the cost-saving facts. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-22145

Photo above shows material bay of main carshop of Norfolk and Western Railway in Roanoke, Virginia, in which operate two twenty-five ton Whiting cranes, equipped with Westinghouse Load-O-Matic* a-c control systems, handling heavy plate and other material for car-manufacturing operation. Westinghouse Load-O-Matic crane control is ideal for applications requiring unusual stamina, ease of operation and low maintenance cost. Provides smooth, stepless speed control without the cost and complexity of d-c conversion equipment. *Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS CBS TV FRIDAYS.

For more facts Circle 495 on Reader Service Card

ADVANCE "HYDRO-VAC" VACUUM . . .

Picks up anything . . . faster!

These super-powered industrial vacs gulp chips, oil, water—all kinds of wet or dry materials—in seconds!

Here's the vac that makes light work of tough clean-up jobs. Has super-suction power. Holds 25% more because it's *square*. Ribbed square tank means extra strength, too. Has heavy-duty moisture and dust-proof motor. Comes equipped with 20″ or 26″ floor tools—twice as easy, twice as fast as conventional smaller tools. You need fewer strokes . . . get faster cleaning.

Call your Advance distributor or use the coupon for complete information. How about right now!

LEASE AND FINANCE PLANS AVAILABLE

ADVANCE SPEEDBOY DELUXE

For complete floor care, team the Hydro-Vac with an Advance floor scrubbing-and-polishing machine—another of Advance's complete line of floor care equipment designed to make cleaning easier.

ADVANCE

ADVANCE FLOOR MACHINE CO.
119 Industrial Center
Spring Park, Minn.

ADVANCE FLOOR MACHINE COMPANY
119 Industrial Center
Spring Park, Minn.

☐ Send complete information on the "Hydro-Vac" Vacuum

☐ Send literature on other Advance Floor Maintenance Equipment.

Name_____

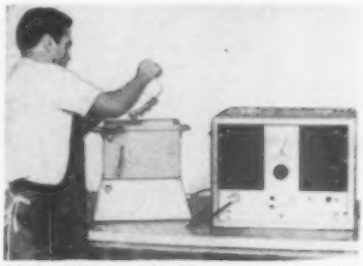
Address_____

City_____

FACTORY / EQUIPMENT NEWS

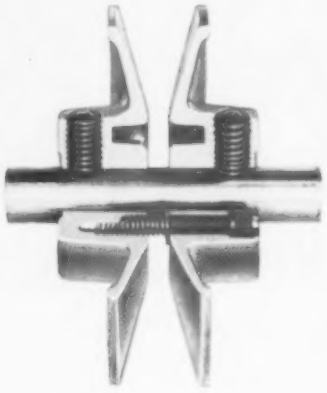
Begins on page 78

For more about these items, circle item numbers on Reader Service Card next to back cover.



136—Ultrasonic Cleaner has "multi-power" transducer that will clean objects not cleanable with conventional units. Produces intense vibrations that blast dirt away quickly, efficiently. In 250- to 1000-watt, 3- to 19-gal. tank capacity units. *Acoustica Associates, Inc.*

137—Foot Valve, of all-plastic construction, is immune to corrosion. Removable ball-type check valve prevents back flow in sumps, tanks, etc. Plastic screen at suction end prevents intake of débris. In ½- to 2-in. sizes, Type I and II PVC. Easy to clean. *Chemtrol.*



138—V-Belt Drive Pulley, 3½-in. dia., has socket cap screw that can be turned to desired rpm. for driving pulley. Both halves are directly fastened to motor shaft to eliminate parallel or angular misalignment. For ⅜- to ⅝-in.-wide belts; bore sizes ½ to ⅝ in. *Tann Corp.*

Turn the page

For more facts Circle 496 on Reader Service Card

Picture of a needless expense— filmed to help management prevent it

The film clip is taken from a Texaco movie about grease, called "Shear Magic." It shows a grease-lubricated roller bearing that has literally been eaten up by rust because improper lubricant was used.

To help you take steps to prevent this same occurrence "Shear Magic" presents the latest advances in greases and grease-testing methods.

You will see how *only* the right greases protect against heat, water, cold, dust, shock, and other conditions. You will find out about new greases, their components and capabilities.

You will learn how the right grease schedule—one planned exactly for your operation—can help you reduce maintenance and replacement costs and substantially improve your company's profit picture.

There is no "hard sell" in "Shear Magic," only informative talk. Texaco will be glad to arrange for a showing of the 25-minute sound film right in your plant. To start the projector rolling, just mail the coupon.

TEXACO

Texaco Inc.
Room 2006, Dept. F-G-21
135 East 42nd Street
New York 17, N. Y.

Please send me information about a free showing of "Shear Magic" to my organization.

Name_____

Company_____

Address_____

City_____ State_____

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

Tight spots, low clearance . . . no problem for highly maneuverable A-W 210 hydraulic crane . . . shown here speeding installation of new continuous wiredrawing machine in John A. Roebling's Sons mill, Roebling, N. J.

Versatility, maneuverability of A-W 210 cranes save time, labor in N. J. plant

"The outstanding performances of our Austin-Western hydraulic cranes and the many new uses to which they are constantly put continues to amaze us." That's what F. A. French, chief plant engineer at John A. Roebling's Sons, says about his company's two Austin-Western cranes.

Save many times cost

He adds, "The cranes have saved us many times their cost. One once did the work of a heavier electric crane which was out of commission for 3 weeks. Without the A-W the entire mill would have been down. I hardly know how we'd operate the plant without them anymore.

"A month doesn't go by without someone saying, 'You ought to see what we're doing with the A-W now!' The cranes are tremendous time and labor savers. Their maneuverability is amazing. There doesn't seem to be any place our operators can't take the A-W's with all-wheel steering.

"They are such useful pieces of equipment that they're kept busy on all three shifts and yet they require only normal maintenance."

3 models now available

Austin-Western hydraulic cranes are available now in three models: the 210 basic self-propelled rubber tired unit with 18-ft. telescoping boom which rotates in a full circle; the 210-P for truck and stationary mounting; and the model 220 with counterweighted boom for greater lifting capacity. Choice of gas or diesel power. A wide range of optional equipment offers added versatility. Learn how you can save time and labor for greater profit with A-W hydraulic cranes. See them at your nearest A-W distributor's or write us today for full information.

Plant cleanup is no problem with an A-W sweeper on the job. Available in two sizes—2-yd. Model 40 and 4-plus-yd. Model 60.

Austin 100th YEAR Western
CONSTRUCTION EQUIPMENT DIVISION, AURORA, ILL.
BALDWIN · LIMA · HAMILTON
Power graders • Motor sweepers • Road rollers • Hydraulic cranes

FACTORY / EQUIPMENT NEWS

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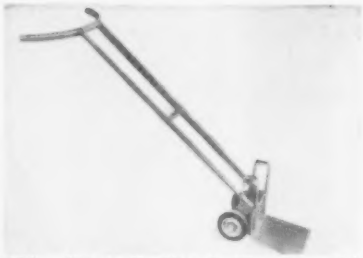
For more about these items, circle item numbers on Reader Service Card next to back cover.



139—"Toter" Hand Truck, with 350-lb. capacity, handles tote pans, kegs, and other small heavy packages. Eliminates manual pushing or dragging. Lifts loads from floor by placing 10x10½x¼-in. toe plate under load, then pressing down on handle. *Colson Corp.*

140—Turret Punch Press, tape-controlled, automatically locates and pierces holes in sheet metal or plate at high speed. Fast, accurate short-run piercing method produces openings of any size or shape in 8-in. dia. Capacity to ⅜-in. thickness. *Wiedemann Machine Co.*

141—Automatic Wire Cutter handles most commonly used hook-up wire and sleeving at 1000 ft. per hr. For small manufacturer who finds larger machine expensive or impractical for short-run production. Cuts up to 500 pieces, in 2½- to 25-in. lengths. *Electronics Industries.*

142—Impact Wrench, with rated capacity of 1¼ in., produces high power for its 20⅞-lb. weight. For large construction equipment, to erect steel structures, and for boiler and heavy plant maintenance. Air motor cannot "burn out" from overloading. *Gardner-Denver Co.*

Turn the page

Change hats
with your maintenance man . . .

You'll find out, with . . .

Vertical Lift Metal-clad you perform normal breaker maintenance in 20 minutes

Ask your maintenance man which make of metal-clad switchgear is easiest and quickest to maintain, and it's an odds-on bet he'll tell you General Electric Vertical Lift.

He can show you why. For example, one man, in just 35 seconds, can remove the box barrier to inspect the contacts. The arc chutes do not have to be removed. In fact, he can complete routine maintenance of an entire Vertical Lift breaker in 20 minutes or less. Saving his time saves you dollars. General Electric Company, Schenectady 5, New York. 511-54

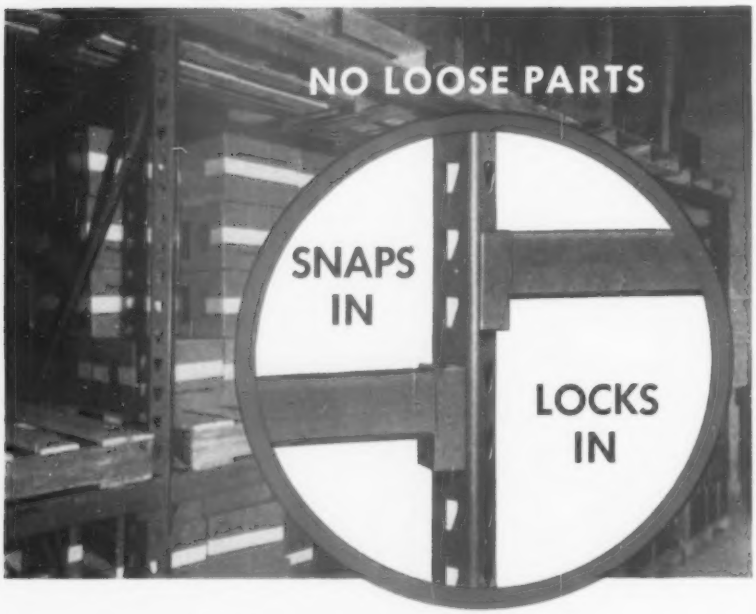
Progress Is Our Most Important Product

GENERAL ELECTRIC

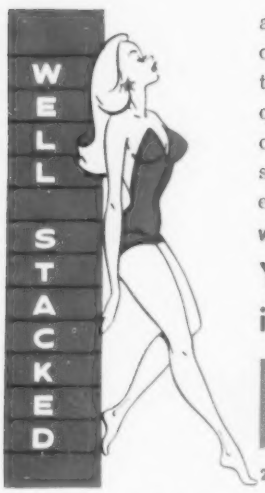
For more facts Circle 499 on Reader Service Card

FAST!

EMI *air-row head* FULLY ADJUSTABLE PALLET RACKS



★ EASY TO ERECT
★ ONLY 2 BASIC PARTS
★ SIMPLE TO ADJUST
★ QUICK TO RELOCATE



EMI AIR-ROW Head Racks easily adjust to stack pallets, skids, dies and bulk of varying heights. Upright frames are tied together with sturdy steel support beams which quickly snap into AIR-ROW slots in the vertical post. Forge lock fittings on the ends of the support beams insure positive self-locking engagement with no sway or pop-out.

WRITE FOR OUR COMPLETE CATALOG!

You can stack or ship ANYTHING in any industry on EMI racks

EQUIPMENT MFG. INC.

21561 HOOVER ROAD • DETROIT 5, MICHIGAN

FACTORY / EQUIPMENT NEWS

Begins on page 78

For more about these items, circle item numbers on Reader Service Card next to back cover.

143—Micro-Hardness Tester operates semi-automatically for use on production line or in laboratory. Provides fast, easy scanning of small parts through powerful microscope. For cutting tool carbide tips, instrument pivots, surgical needles, etc. *American Chain & Cable Co.*

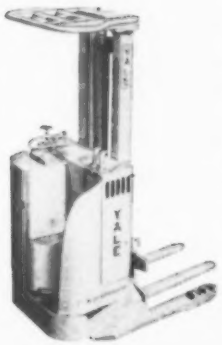
144—Solvent Recovery Unit, with special-type Resorber, filters up to 85-95% of solvents or contaminants from air. Good for metal degreasing, solvent rendering of fats, etc. Reduces heating and cooling costs. Two series handle from 400 to 4400 cfm. *Barnebey-Cheney.*

145—Overload Detector, for power presses, electronically shuts off machines when misfeed or jamming causes die height to change more than 0.004 in. Detector is compensated for different press speeds, die wear, temperatures. No presetting or adjustment required. *Wintriss, Inc.*

(This item is being re-run from October FACTORY, page 98, because the word "no" in the final sentence was accidentally omitted.)

NEW Yale Warehouser builds profits 3 ways

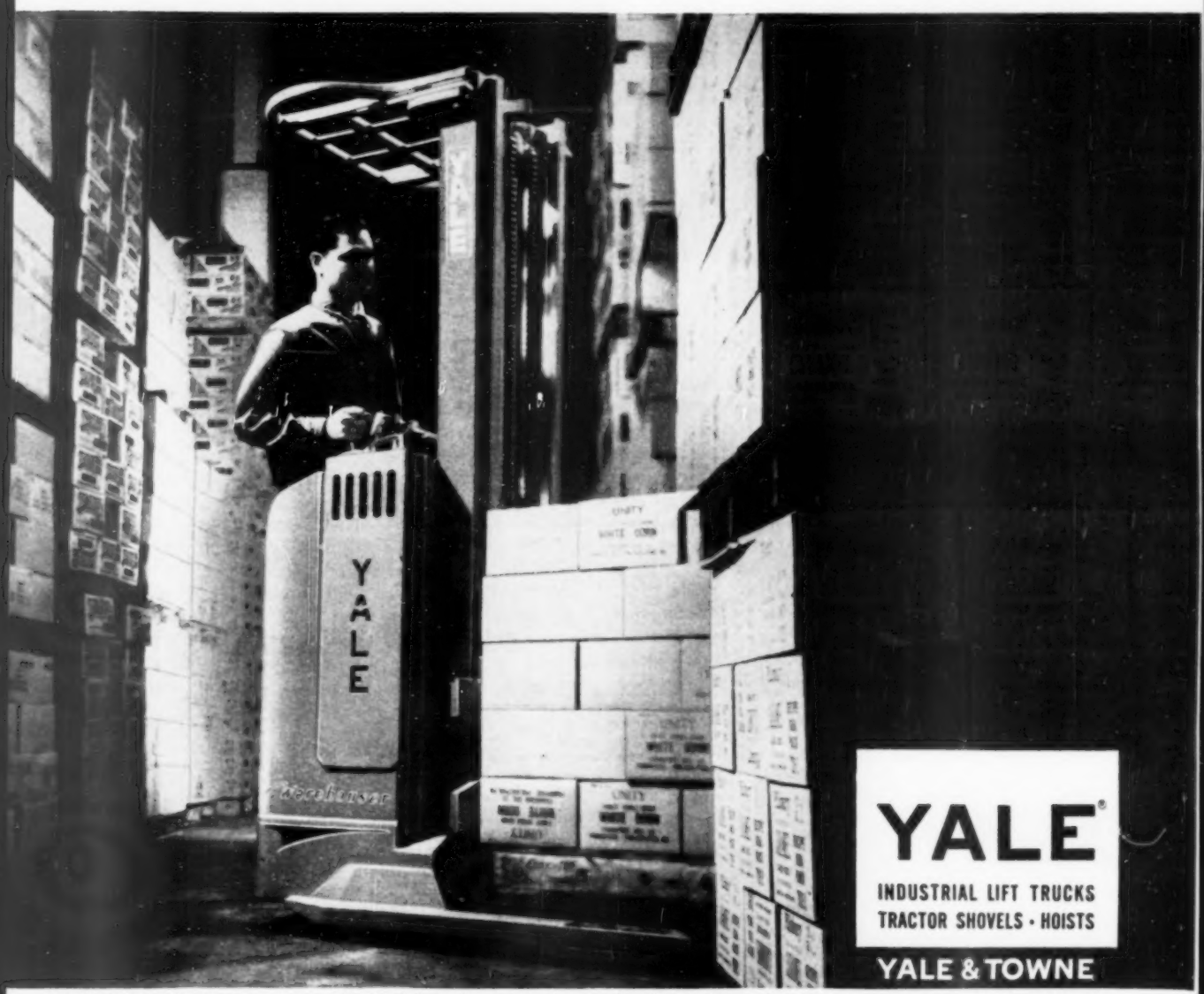
(1) 24-volt system speeds operation cycles (2) Advanced design increases operator efficiency (3) Rugged construction means more time on the job



There's more power in the new Yale Warehouser! 24-volt battery provides faster lift and travel! Faster operation cycles! And your operator will be less fatigued at the end of the day. He has comfortably positioned, easy-to-operate controls! This precision control plus increased visibility protects against product damage.

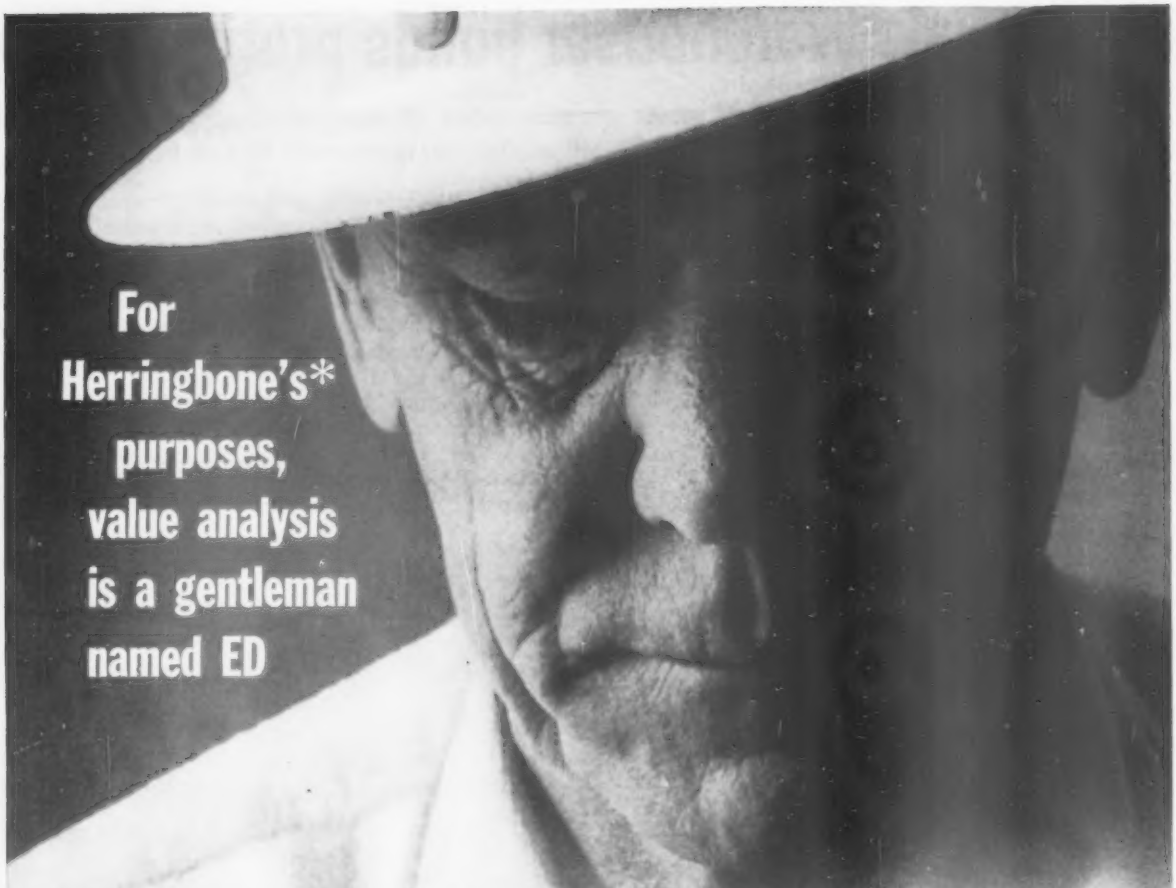
Your new Yale Warehouser will spend more time on the job! More days on the job! Operational maintenance is minimized because all components are in one fully-accessible compartment. More years on the job! Durable construction! Service access doors protected against bumps—no sprung doors. Frame, chassis, outriggers and channels are a single welded unit.

This new Yale narrow aisle truck is available in straddle and Extend-A-Fork models—in capacities of 2,000, 3,000 and 4,000 lbs. Standard 12-volt models also available. The new Warehouser takes its place as part of Yale's complete line of industrial lift trucks and hoists—gives equally efficient performance in the warehouse or as part of a fleet. Contact your Yale representative or write for brochure #1535H to The Yale & Towne Mfg. Co., Yale Materials Handling Division, Phila. 15, Pa., Dept. RT 1-H.



Yale Materials Handling Division, a division of The Yale & Towne Manufacturing Company. **Manufacturing Plants:** Philadelphia, Pa., San Leandro, Calif., Forrest City, Ark. **Products:** Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks • Worksavers • Warehousers • Hand Trucks • Industrial Tractor Shovels • Hand, Air and Electric Hoists

For more facts Circle 501 on Reader Service Card



For Herringbone's* purposes, value analysis is a gentleman named ED

Or Joe, or Sven, or whatever the name of the man is in your organization whose opinion on wire rope you most respect. You can take all the value analysis forms ever made and fill them out and get some pretty promising answers. The straightest and clearest answer you'll ever get is from the head gentleman who *works* with the rope; the same man who comes back to you and tells you that the rope he works with *doesn't work*.

We take this stand because the new Roebling Herringbone is championed by men who work with it – the first to feel the impact of a wire rope's success or failure – and the first to tell you about either.

Roebling Herringbone–the two-ropes-in-one rope–is doing things that construction operators find hard to believe–but love to admit. It has prompted a series of some of the nicest testimonials you ever saw.

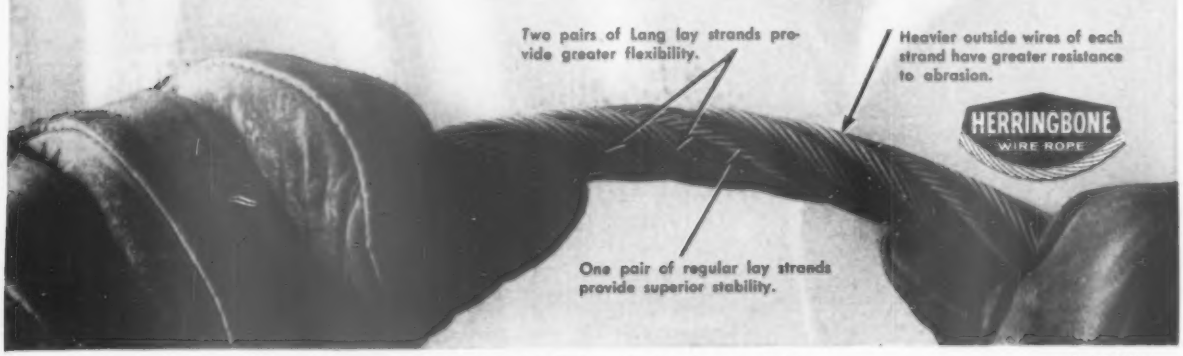
When you come right down to it, their satisfaction is twofold; after all they are working with both a Lang lay and regular lay rope in one. So they are getting the best that both types of rope construction have to give ... and that's plenty.

If you want to write us and get some pure, unadulterated field reactions, opinions from men who count, just drop a line to Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey. With these, we'll take the liberty of sending you the complete information on the rope that makes value analysis a sure thing by the mere specifying ... Roebling Herringbone.

*Reg. Appl. For

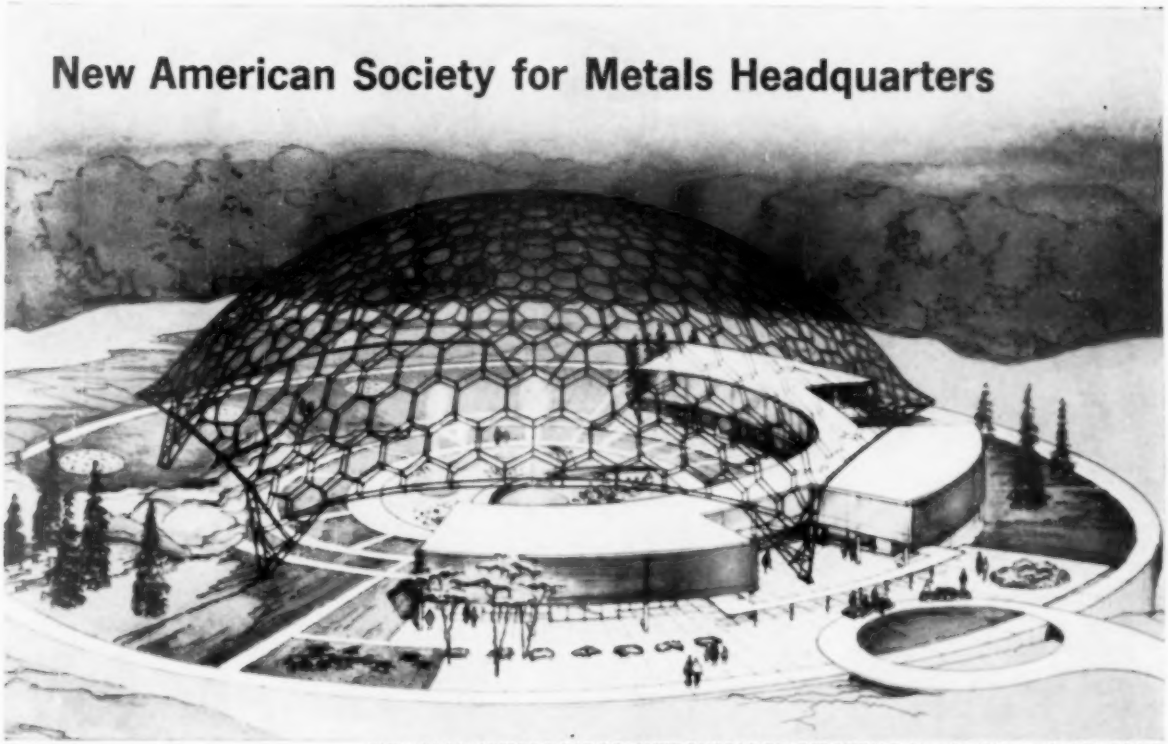
ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation


Two pairs of Lang lay strands provide greater flexibility.
Heavier outside wires of each strand have greater resistance to abrasion.
HERRINGBONE
WIRE ROPE
One pair of regular lay strands provide superior stability.

For more facts Circle 502 on Reader Service Card

New American Society for Metals Headquarters



NEW HEADQUARTERS BUILDING, AMERICAN SOCIETY FOR METALS, Novelty, Ohio, east of Cleveland.
Architect: JOHN TERENCE KELLY. *Consulting Engineer:* MAYER AND VALENTINE. *General Contractor:* GILLMORE-OLSON COMPANY. *Plumbing and Heating Contractor:* SPOHN HEATING & VENTILATING COMPANY. *Dome Design:* R. BUCKMINSTER FULLER, SYNERGETICS, INC.

Imagination shows in the building — practical planning in the choice of Jenkins Valves

Metals Park . . . dramatic new Headquarters of the American Society for Metals, is a showcase for the wonderful world of metals.

The geodesic dome, "world's largest space lattice," required thirteen miles of tubing and rods in open-work trellis. It stands as a monument to man's imagination in the use of the raw elements of the earth, as symbolized in the circular Mineral Garden below. At Metals Park, metals are everywhere and everything — providing an ideal background for ASM's many services to 30,000 members in the metal industry.

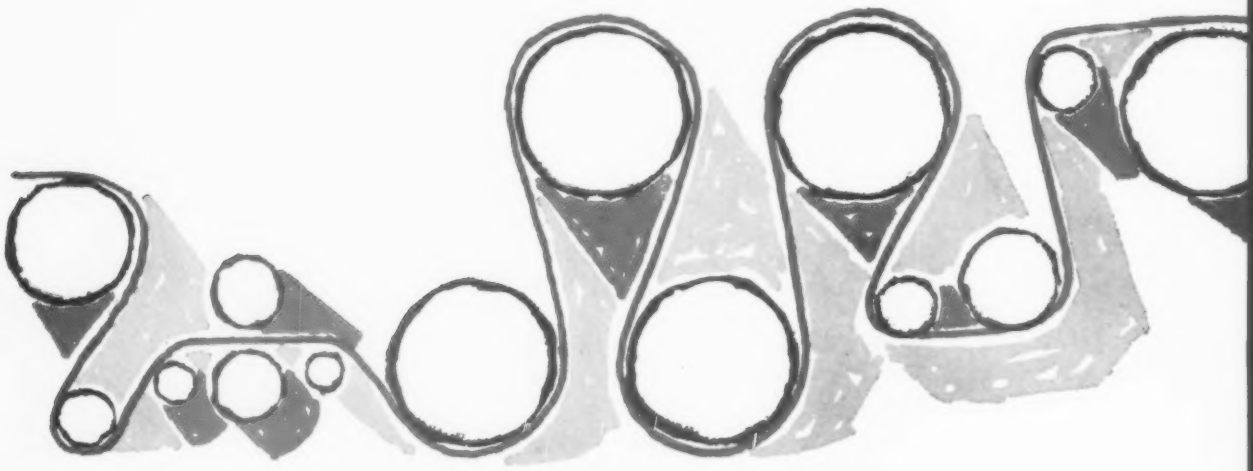
You would expect men of metals to choose metal products of superiority for their headquarters. And they did — including Jenkins Valves for *all* plumbing, heating and air conditioning lines. They had good reason: superior metals give Jenkins Valves the extra stamina that makes them famous for long life and dependability.

Whenever a building is planned with the *future* in mind, it's wise to specify or install Jenkins Valves. They're the *practical* choice to assure longtime efficiency and economy — and they cost no more. Jenkins Bros., 100 Park Ave., New York 17.

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

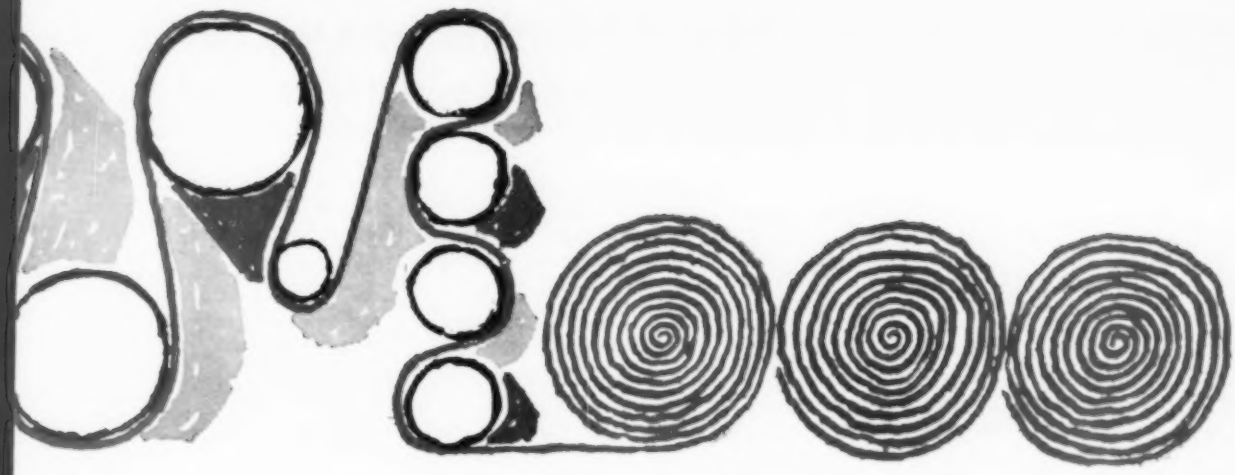
JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864
Jenkins Bros

Before Crown-Zellerbach Powered-Up at Port

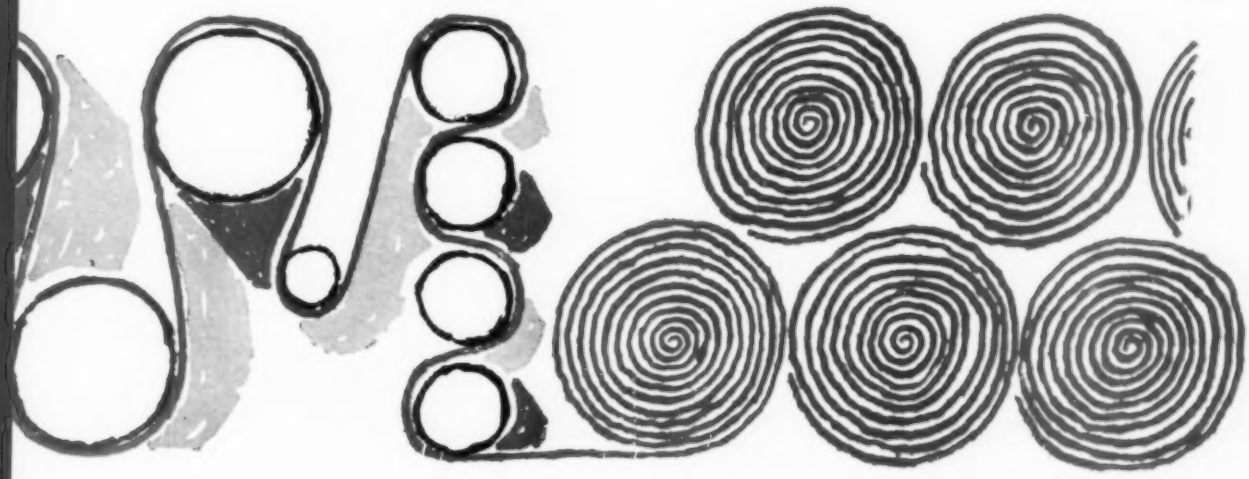


Now, greater use of electric power helps

POWER-UP FOR PROFIT



Townsend, one machine produced this much paper



increase machine capacity, reduces unit costs

ELECTRICALLY

Power-Up is a Westinghouse program to help you increase profits through greater productivity. In your plant it may be higher capacity machinery or an engineered drive system to provide increased speed and range flexibility from existing equipment. Whatever your need, maximum use of low-cost kilowatthours can help you earn satisfactory profits. You will need more capacity to meet the 40% increase in demand for goods by 1965.

Be sure—like Crown-Zellerbach—that your electrical equipment is engineered to produce profits as well as output. Call your Westinghouse representative or your electric utility power sales engineer. They can tell you the electrical steps you can take now to start a Power-Up program in your plant. J-96137

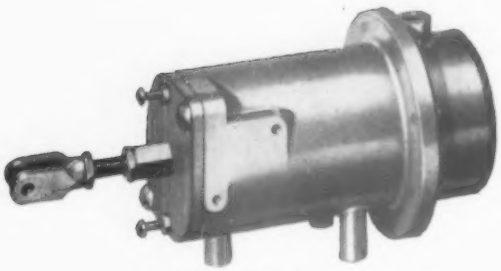
YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

For more facts Circle 504 on Reader Service Card

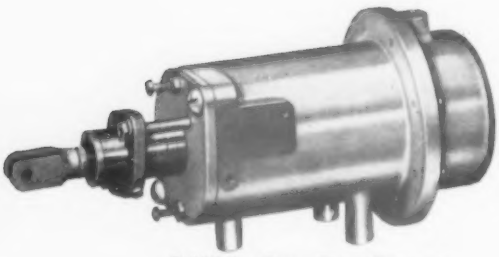
JOHNSON PISTON-TYPE DAMPER OPERATORS

ASSURE MAXIMUM POWER FOR ACCURATE CONTROL OF DAMPERS



D-251 Piston Damper Operator

- Powerful, long-stroke design. Allows damper to be operated *directly* from piston rod for accurate, positive positioning. No linkage or levers to lessen power. Outperforms conventional operators.
- Simple, trouble-free construction. Spring and diaphragm are fully enclosed. Powered by molded rubber diaphragms which are age- and heat-resistant.
- Adjustable stops permit limiting stroke in either direction.
- May be mounted in any position on damper frame, wall, or duct.
- Attractive die-cast, non-corrosive body.
- Size Nos. 2, 3, 4, and 6.

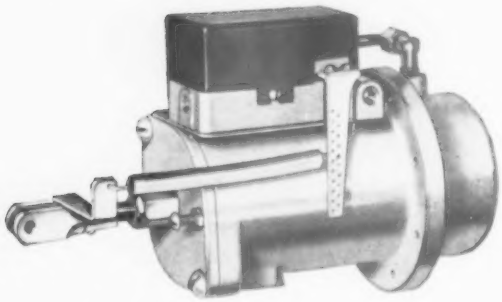


D-255 Two-Stage Piston Operator

Designed especially for unit ventilator applications, the D-255 two-stage operator has the same general features as D-251 plus:

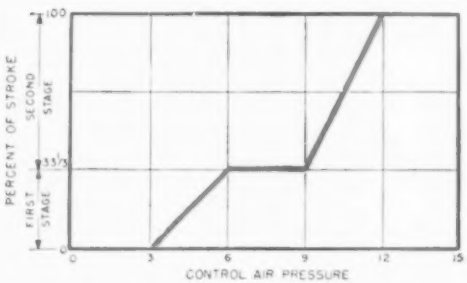
- Two-stage operation (see chart below). First stage is adjustable 0 to 50 per cent of total stroke.
- Compact, fits all unit ventilators. No. 3 size only.
- Choice of molded rubber or molded silicone diaphragms. Heat- and age-resistant.
- Self-lubricating Nylon insert stem guide.

For full details on the Johnson equipment shown here, write for Bulletins D-251, D-255 and D-265. Johnson Service Company, Milwaukee 1, Wisconsin.



D-265 Pilot Positioner Applied to D-251 Piston Damper Operator

The D-265 Pilot Positioner provides maximum and accurate repositioning power in response to very small changes in pressure from the controlling instrument. Assures proper operation independent of friction, changes in air velocities, or other variables. May be applied to all sizes of D-251 operators.



Relationship between stroke and control air pressure of D-255 Two-Stage Piston Operator.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

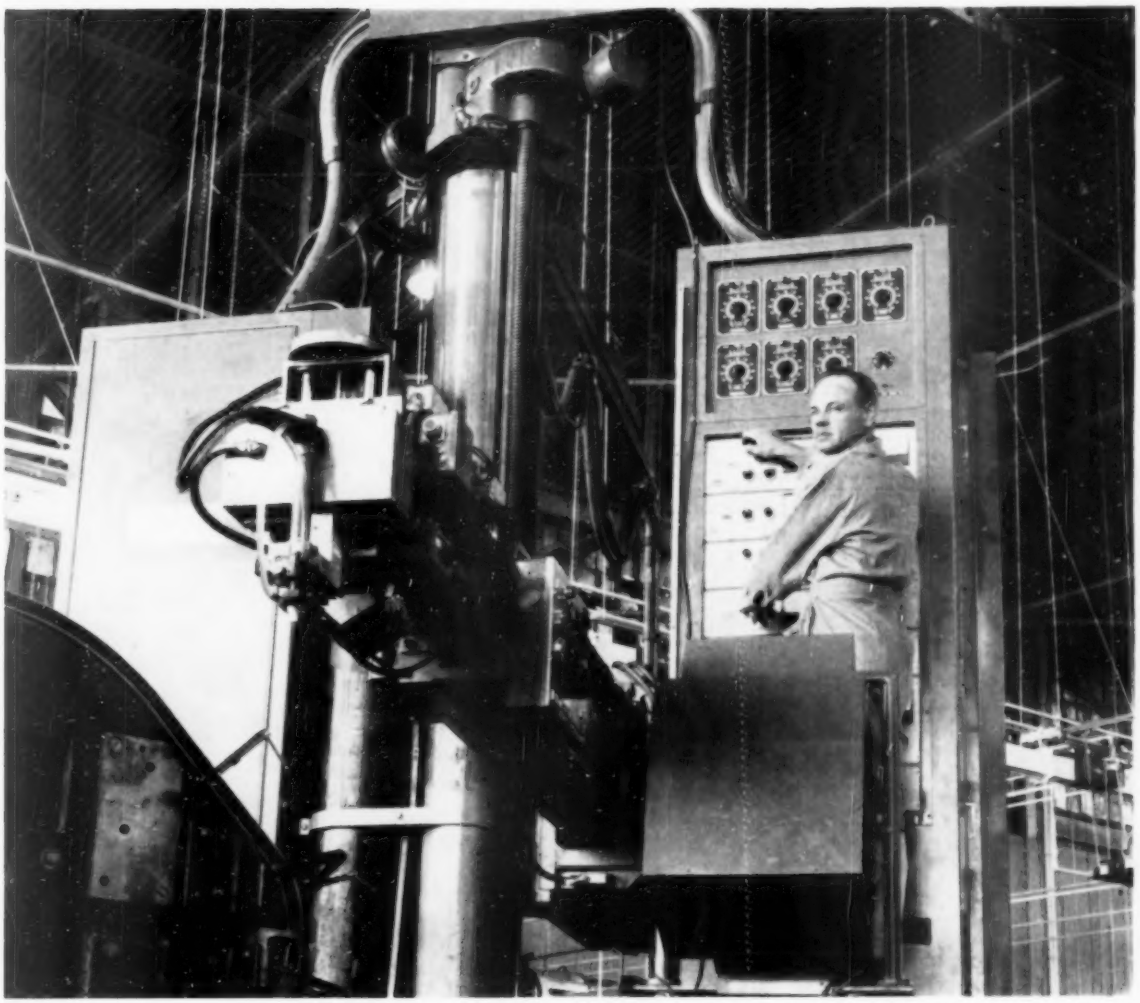
For more facts Circle 505 on Reader Service Card

FACTORY

PLANT OPERATING MANAGEMENT

CASE BOOK

WARREN J. KING
Associate Managing Editor



AIRBORNE WELDER RIDES HIGH TO FABRICATE SUBASSEMBLIES FOR NEWEST BOMBER . . . PAGE 107

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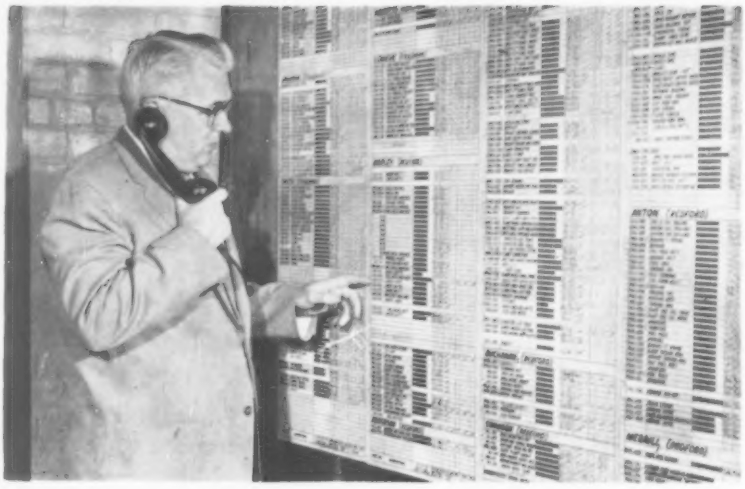


Quick Control With Wall Charts

Looking for a method to help you ride herd over a thousand critical parts? One that lets you know at a glance if you're up to date on process planning, tooling, and equipment schedules? Then try the system used by Raytheon Company.

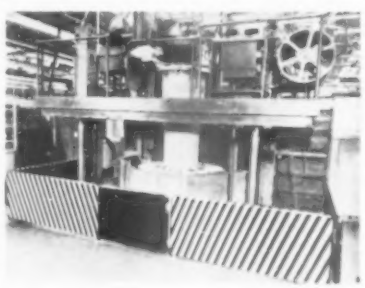
Large plastic charts on the walls of engineering production have replaced folders buried in file cabinets and entries scribbled in individual notebooks. The charts have columns for part number, description, progress percentages, engineering release data, and tooling information. Large letters make everything visible from anywhere in the room. Subheads give further information breakdowns, and different colors show progress in all areas.

The board is divided into two sections—one for fabrication methods, the other for assembly methods. Names of the responsible engineers are lettered in. Each man provides data on his projects. The chart also indicates which key men are delegated to take care of certain tools and parts. The wall chart is no mere office decoration. It's updated daily, consulted hourly.

There's no thumbing through files when a production snag comes up. The responsible engineer is called in, shown the chart, asked for an explanation. But this rarely happens because those concerned drop in regularly to study the chart. System works well—all schedules for the past three years have been met.

The wall chart also eliminates the need to make time-consuming references to a master materials list book. In addition, it tells Raytheon total workloads for individual workers at a glance. This is important in re-scheduling production quickly as changes occur in missile parts. It means production must be switched without any lead time on both parts made in Raytheon's plant and those subcontracted. Sometimes as many as 50 change orders a day have been issued. Thus a finger-tip information system is essential to keeping up with stiff schedules.

Source: Harry Midgely, Chief Manufacturing Engineer, Raytheon Company, South Lowell, Mass.



Platform Lift Speeds Machining

This operator is rising to meet a machining problem caused by giant aluminum castings for jet engines. Platform moves up and down, has a maximum elevated height of 8 feet. With it the operator can supervise

all machining operations on the 6-ft.-high, 36-in.-dia. casting. From his raised position he directs work, carries out necessary gaging during machining operations.

Platform was chosen by Pratt & Whitney Aircraft Division, United Aircraft Corporation (E. Hartford, Conn.), for its stability, comfort, and operator safety after engineers had experimented with several other elevating methods. It has cut-out section that fits around machine table at base of the vertical turret lathe for turning the 3000-lb. casting.

When not in use, the 5x15-ft. platform remains at floor level. Two hydraulic ram shafts sunk 13 feet below the floor are powered by a 5-hp. electric motor to raise and lower the unit. Controls on the platform deck stop its rise at any desired height. A special revolving drum on the platform holds working drawings or blueprints so they can be spread out for easy reading. With this method, the operator never needs to climb down or lower the platform until the job is completed.

Flame-Cutters Follow Template

This electronic tracer moves along the outline of a drawing or paper cutout by following the intersection of light and dark-colored surfaces. In so doing it guides a bank of eight flame-cutting torches. The automatic cutter is part of a modernization program at the Los Angeles district headquarters of U. S. Steel's Supply Division.

The unit can cut an unlimited variety of shapes from plates, billets, and slabs up to 12 inches thick. Machine cuts shapes up to 12 feet wide by 40 feet long in carbon, alloy, or stainless steels. Mounted on auxiliary rails for greater mobility, the eight motorized torches produce circles up to 144 inches in diameter, rectangles up to 144x480 inches. Torches can be adjusted to cut straight-line beveled edges to such close dimensions that further processing is sometimes eliminated. This reduces the need for both extra handling and machining.

Delivery Dates Pace Production

Everyone knows exactly when a plane is due for delivery at Convair's Palmdale (Calif.) plant. All they have to do to find out where they stand in the production cycle is look at any aircraft fuselage on the production line. A series of stenciled dates on each plane tells workers exactly when a certain phase of the work should be finished.

Workers set their own pace, so there's no rushing to avoid end-of-the-month pile-ups. Target dates have been met extremely well since the labeling system was instituted in June. At this point the plant has gained three weeks on schedule.

First date stenciled is the month Convair will deliver plane to the Air Force. This is in large letters on the tail section. Just forward of this is target date for completion of Phase II (including electronic installation and boresight). Last date is for AF flight completion. This goes on the nose section of the plane—where the AF star is placed.

Welder Rides High

(Cover Story)

The operator of the automatic fusion welder (shown on the cover) rides through the air while he's fabricating subassemblies for the 2000-mile-an-hour B-70 intercontinental bomber. The machine was custom-built for manufacturing operations at Los Angeles Division of North American Aviation, Inc.

One of the special features is a special closed-circuit television set-up for monitoring welds in confined areas such as inside cylinders or ducts. The weld head itself is mounted on a boom. This provides 10 feet of usable weld and a rotation of 360 degrees. It's one of several new fusion welders working on high-strength, thermal-resistant alloys at North American.

Replaces Muscle

Opening or closing the discharge valves on boiler feed pumps used to be a good way to build muscles—or get a sore arm—at A. B. Paterson Station of New Orleans Public Service Inc. Doing it manually, the operation took 10 to 15 minutes. Required two or sometimes three men to relieve one another.

But now the valves—10 of them—get opened or closed in one minute flat. And a portable air motor does all the hard work. The motor is attached to a clutch adapter on the discharge valve wheel, then tapped into a nearby compressed air line. Admitting the air opens the valve. To close the valves, the operator just reverses the motor. A yoke bracket supports the motor, relieves the operator of its weight and torque. Total cost, including the air motor: under $100 per valve.

PLASTIC SKYLIGHTS BOOST BRIGHTNESS

There's high visibility in this general storage building of Dana Corporation's Pottstown (Pa.) Division plant. Skylights of translucent plastic panels add to the generous light from fluorescent fixtures. It's all a part of Pottstown Division's $5-million modernization program. Dana used plastic skylight panels extensively. For instance, it replaced all crank-operated glass skylights in sawtooth buildings with fixed plastic panels. Then added a forced ventilation system to change air every 2½ minutes. Cost was $43,000 less than if the old steel sash and glass had been replaced in kind. And it saves on maintenance, too.

Dials Reason for Downtime

Machines were idle too much of the time and management wanted to know why at Kensico Tube Company, Mount Kisco, N. Y. They found the answer by means of a machine operation recording device. It not only records when and how long each machine is inoperative, but also gives reasons.

After the device, called a Centralograph, was used for a short time, the whole downtime story was laid out on a graph. The most frequent reason for downtime came from long delays while operators waited for material. On the basis of this information, the mill distribution and handling system was revised for better efficiency.

Operation of the Centralograph is no more difficult than dialing the telephone. A small impulse contact placed on each machine sends electrical impulses to the central recorder. A continuing line is formed on graph paper as long as the machine operates properly. But when the machine stops producing for any reason the line is broken. By synchronizing the Centralograph operation with a time clock, management knows exactly when and how long each machine is down.

A dial similar to that on a telephone tells why the machine is down. When the machine stops, the operator dials a code. Each number indicates a specific reason for machine stoppage. For example, if the operator dials 1, something is wrong with the machine itself. If he dials 2, it means he is cleaning the machine. The code is impressed on the graph paper at the exact point where the line breaks. In this way, a detailed report on how long and why the machine has been stopped is available to the plant manager.

In addition to production data, the Centralograph gives valuable maintenance information. It helps spot worn-out machinery that no longer performs to minimum standards. These machines betray themselves through a recurring pattern of gaps in what should be a continuing line. A similar pattern emerges when a machine is operated at incorrect speeds.

The Centralograph (D. C. McGiehan, White Plains, N. Y.) cost Kensico about $1500, plus a like amount for installation.

Ups Production Sevenfold

This grit-blaster now turns out seven times as many cleaned angle irons as it used to. How? By better usage of existing equipment and a minor handling innovation.

Formerly, the heavy cast-iron guides for passing angles through the blast unit had high peaks, deep valleys. General Electric's Industry Control Department (Roanoke, Va.) reports the guides handled only two angles per pass. Angles were laid on the two peaks and blasted from above as they passed through the Rotoblast. Then they were turned over and nested in valleys, sent through again, blasted again.

Now the new guides have lower peaks, shallower valleys. Seven angles can go through at once—three on peaks, four in valleys—without change in machine width. Blasting is done from below as well as above. Hence there's no second pass for angles.

NEW FOAM SPRAY PROTECTS, INSULATES

Whitewashed for the holidays! No, just sprayed with weather- and chemical-resistant plastic foam that insulates, too. New portable system to reduce corrosion-control costs was developed jointly by Wyandotte Chemicals Corporation (Wyandotte, Mich.) and DeVilbiss Company (Toledo). Uses standard spray equipment to apply foam fast and easily on flat or irregular surfaces at rate of 10 to 20 broadfeet per minute. Surfaces require little or no preparation for coating. And within five minutes after applying foam, it's dry to the touch. It cures a short time later. Same insulation is achieved with 1-in. coat as with a 2-in. coat of other materials.

Company Uses Soft Sell on Safety

There are two methods used in selling any idea. The soft sell and the hard sell. The Wakefield Company (Vermilion, Ohio) adopted the soft sell for use in its safety program. The results speak for its effectiveness. There has been only one serious accident at the plant since 1942. And this resulted from carelessness and mechanical failure.

Safety at the Wakefield plant is a matter of persuasion rather than force. There are no signs hanging from the wall threatening discipline for unsafe practices. Instead there is a year-round program designed to make employees aware of the need for safety. Wakefield management believes threatening signs just provide a challenge for defiance.

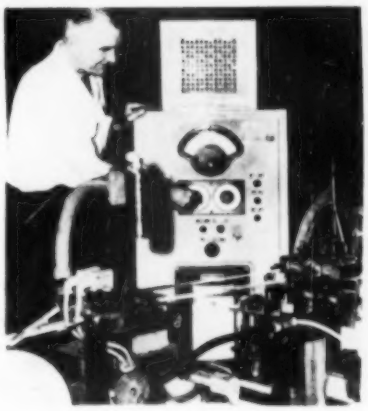
The nucleus of the plant program is the safety committee. The same man has headed this group for more than 20 years. The committee operates on the premise that safety is primarily a matter for safety-minded personnel, rather than a job for an appointed few. There's constant encouragement for all personnel to cooperate in the program.

The job has been anything but easy, especially at the beginning. Sometimes a "showoff" willfully neglected to wear goggles or took needless chances. Today those who need glasses demand them. To further promote safety, the five production men on the safety committee, accompanied by a departmental foreman, make an item-by-item monthly tour. Similar inspections of trucks and other mobile equipment by a senior inspector stop possible danger practices. And every safety measure recommended to the plant superintendent as a result receives first priority for action.

In the assembly department, inspections cover items like equipment, passageways, doors, and—perhaps most important—the attitude of all personnel. All told, there are 15 specific items to be checked and reported upon in this department. An example of potential danger spotted during the monthly inspections involved a package of 8-ft. lighting fixtures. The package was not secured by the usual glass tape before being high-tiered by a lift truck. Though the risk was minute, it was taped at once.

In line with its cooperative approach to safety, the committee works closely with the fire brigade. Groups notify one another when they see the possibility of danger ahead. Similarly, factory men who are trained in first aid are always available—usually two men on the day shift and one man at night.

What results does this program bring? Well, the only accident among 170 employees last year occurred when a worker slipped on a wet spot on the floor. In 1957 there were only two minor accidents.



Spots Bad Stock

Why did forming presses jam at Blackstone Corporation, Jamestown, N. Y.? Foreman and press operator disagreed about the cause of failure. One blamed a faulty press setting, the other, inaccurately gaged stock.

Now an XactRay unit settles the disputes for less than $1-per-week maintenance. This non-contact x-ray thickness gage "looks over" $7.5-million in copper and brass stock annually. Forming presses "swallow" this stock at rate of 160 to 200 fpm. to make radiator and heater fins. But if strip material is 10% thinner or thicker than the required 0.0025 and 0.003 inches, the presses jam. This results in costly downtime and damaged stock.

This is where XactRay (Daystrom, Inc.) enters the picture. The portable unit is wheeled into place to spot-check new strip stock as it starts through presses. The strip chart records reading of the x-ray beam as it passes through the metal

ribbon. If the spot check doesn't uncover defective stock and a press jams the gage is used again to determine extent of the defect. Rejected shipments are then returned to processor together with a copy of strip-chart measurement data.

Central Repair Shaves Safety Costs

Each year Inland Steel spends $250,000 for new safety equipment for its Harbor Works (East Chicago, Ind.). And each year between 8000 and 10,000 pieces of protective equipment require repair.

Two men handle it all. And a centralized safety equipment repair operation in a 600-sq.-ft. area in the plant protection building has helped make this possible.

The repair and maintenance of all safety equipment, from gas masks to goggles, high-top shoes to hard hats, is done in this one place. One of the two men spends full time. The other splits his time—half in the shop, the other half giving safety advice and surveying equipment on the floor.

Benefits of the centralized operation? Better repair work, better supervision, higher efficiency.

Training Boosts Understanding

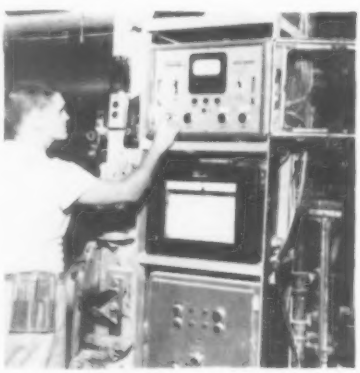
Sometimes misunderstanding among plant service departments can kick up a storm as big as the inter-service rivalry in the Pentagon. Ever hear an electrical maintenance manager air a complaint something like this: "What's the matter with those people in machine repair, anyway? Don't they know we have to turn this machine on now to hook up our test equipment? *Nobody* gives a hang about our problems!"

These irritations—minor as they may seem—can grow into real trouble-spots if ignored. Actually one of the best ways to eliminate "inter-service" conflicts in the plant is to have each department explain its problems to other departments. This helps them coordinate their efforts. That's what was done at the Electric Typewriter Division of International Business Machines. At this new plant they anticipated the problem, forestalled it.

IBM set up a training program for supervisory members of the plant services department. Conducted during working hours, the weekly course offers each of 19 members a chance to explain his department, its problems, and its plans. As IBM puts it, "we are telling each other as much as we can about our jobs."

The class member handling a specific meeting makes his speech, passes out a written technical report, conducts a question-and-answer session. Slides, movies, other training aids are used. Attendance and interest have both been excellent. Result of the course: Plant services operate as a team.

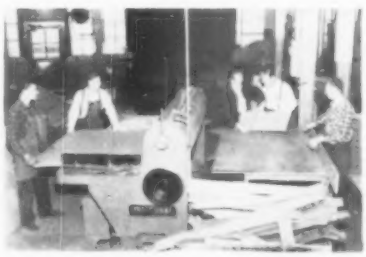
Source: M. C. Blodgett, Functional Manager of Plant Services, Electric Typewriter Division, International Business Machines Corporation, Lexington, Ky.



Insures Quality

This beta-ray gage makes sure it's right where it's needed, too. Provides the high quality Reeves Brothers needs at its Vulcan plant (Buena Vista, Va.). The machine served by the gage calenders coatings onto fabric. Fabric is used to make diaphragms in fuel pumps, carburetors, and other components for military aircraft, rockets, and missile systems.

The beta-ray gage measures mass and thickness. It also continuously graphs variations from tolerance. By watching a dial indicator, operator can control pitch, spread, and temperature of coating rolls.



Scrap Serves Useful Purpose

Much of the baled cardboard formerly sold for scrap now has a new job at General Motors' Oldsmobile Division (Lansing, Mich.). An enterprising scrap department employee decided it was just the thing to divide and protect parts for shipping. So this paper-slicing machine (photo) was purchased and installed. Now all cartons in which supplies are received get cut up for shipping purposes. For the money-saving suggestion, the employee received GM's maximum award of $2500.

Tints out Sun

The abundance of jalousie windows in the new Dixie Aluminum Company plant (Rome, Ga.) created a pleasant sunswept work area. But production was off all the same. The reason: Sunlight reflected from the company's product—aluminum extrusions—into the eyes of employees affected their output.

The problem was solved by coating the inside of windows with a liquid plastic called Sun-X Tinting. The Du Pont product not only cuts glare, but reduces heat and fade as well. It's easy to care for the windows—with normal washing methods. There are no special maintenance problems.

1. CONVEYOR BRINGS CARTONS TO AREA.

2. PACKERS CONSOLIDATE UNITS.

3. CONSOLE OPERATOR REGULATES FLOW.

4. PALLETIZER READIES UNITS FOR SHIPPING.

Electronic Sorting Makes Shipping Simple

A high-speed electronic sorting system, extensive conveyors for handling individual and multi-unit cartons, automatic pallet loading equipment—all these work together to streamline handling of 100 tons of product per day at Western Electric Company's Indianapolis plant.

The conveying and palletizing system gives the company two benefits. It eliminates the need for additional trucking facilities. And it makes the heavy physical effort of manhandling cartons a thing of the past. Western Electric engineers designed the system. Major components were supplied by Alvey Conveyor Manufacturing Company. Here's how the set-up works:

1. An overhead belt conveyor carries general-purpose telephone sets packed in individual, coded cartons from manufacturing area to merchandising building. It discharges them onto a spiral gravity conveyor. This unit acts as a buffer to reduce speed of cartons so they are spaced approximately 40 inches apart as they board a high-speed sorting belt. While riding on the sorting belt, cartons pass in front of a battery of electric eyes. The eyes react to reflective tape on each carton and actuate deflecting units that route cartons to one of eight conveyors leading to packing stations.

2. Eight spiral conveyors each carry cartons of phones (of one particular type) to each of eight final packers. (The ninth spiral conveyor collects any carton the sorting system fails to identify.) These men hand-pack telephones eight to a carton. They send full cartons up inclined belt conveyors to the right of each packing station to eight accumulation-controlled live roller conveyors. These conveyors are 12 feet above floor level.

Each accumulation conveyor has controls to indicate when a pallet load is available. Additional controls located near the incline belts automatically shut off the motor driving it if the accumulating conveyor is completely loaded.

3. A special console regulates carton flow from accumulation conveyors to pallet loader. By means of pilot lights and pushbuttons the attendant can select the line that is ready for pallet loading.

From an accumulating line, cartons travel onto "Y" sections feeding a live roller conveyor. This, in turn, moves units onto a controlled live roller conveyor. Next, cartons transfer to a belt conveyor which serves as a brake and metering unit for feeding unsealed cartons into gluing and compression equipment. From there cartons go to the automatic pallet loader.

4. The automatic pallet loader receives cartons, automatically arranges them on a pallet in a pattern selected by the operator at the console. The machine can arrange cartons in different patterns with required number of tiers. Peak capacity exceeds 40 cases per minute.

INVENTORY'S THERE—IF PHOTO SAYS SO

This photo is an actual inventory record from the files of the Rohr Aircraft Company, Chula Vista, Calif. Piled into trucks and racks is every piece of fabricating material and equipment on hand at year's end in this particular part of the plant. Photo attests to actual existence of the material, while an accompanying audit itemizes each piece. Picture acts more as a locator guide than as an audit. Card being held by a member of the plant's auditing department has a number keying the location of material and the date of inventory. In all, 13 pictures were snapped in various parts of the Rohr plant. They afforded the accountants a sample with which to test the reliability of company records.

Saves Time and Steps

A multi-station call-box system cuts timekeeping costs $50,000 annually at Aeronca Manufacturing Corporation's Middletown (Ohio) plant. In all, the new system eliminates the need for 15 timekeepers. And workers lose no time looking for the foremen or timekeeper to get their job cards.

Aeronca installed 38 call boxes (photo) in all production, tool design, manufacturing, and engineering departments in the main plant. Also cut its metal products division (about four miles away) in on the network. The call boxes are directly connected to three receiving consoles in the main plant's central data-processing office.

When an employee changes from one job to another, he walks to the nearest call box (there's one within 75 feet of every work center). When he presses a lever, a light flashes on all three receiving consoles. Any one of three operators takes the call. The worker dictates his number, number of old job, and number of new one. Average time per job checkout: 10 seconds.

If the information is not clear, the console operator asks for a repeat. After recording the pertinent data on a standard punched card, she passes it to three key-punch operators, who manually punch out the non-static data. Static information, such as hourly rate, clock number, and department, is gang-punched from the employee's attendance card. About 3500 job tickets are handled per day.

Foremen distribute cards for the day's first job at the beginning of each shift. These cards are made out by hand. Thus Aeronca eliminates a peak load on the system at the start of shifts. All job cards made out subsequently for each employee are placed together behind his attendance card. Any discrepancies can be checked immediately against a master file of all current job orders. Thus an incorrect or closed job order shows up at once.

As a further safeguard, checkers go into the plant periodically to spot-check jobs in process. This information is compared with timecards as reported by employees over the "squawk-box." Thus far, few errors have been discovered.

Men Get a Lift

Locating plant services overhead provides a lot more floor space. But it sometimes creates a problem for maintenance men. At International Business Machine Corporation's San Jose plant, services are 17 feet up in the building superstructure. The old-fashioned ladder and scaffolding method of reaching these facilities was time-consuming, difficult, and often unsafe.

Maintenance department thinkers went to work and devised a cage-like work platform that can be mounted on a standard 4-ton fork-lift truck. It's made of heavy angle iron. Measures about 6 feet high, 4 feet long, 3 feet wide. This design, coupled with the truck's original lift of 10 feet, gets maintenance men up to lofty service lines.

Advantages include increased mobility and maneuverability, plus larger working surface. Tools and parts storage at working level also saves time going to and from maintenance toolcribs. Another important gain, says IBM, is increased worker efficiency and higher morale.

Absenteeism Swings Low

Four months of music have had three positive effects at Loft Candy Corporation's packaging plant (Long Island City, N. Y.). First, absenteeism has dropped 7%. Second, tardiness is almost non-existent. Third, output is up 9%.

The company originally installed its Muzak system (specializing in planned work music) after a survey on absenteeism showed job boredom to be a major cause of the company's high absenteeism rate. Absenteeism had been a problem for some time prior to the survey.

Employee morale, effort, and attendance improved noticeably almost as soon as program started.

Induction Heating Does Soldering

When a high-frequency induction heater took over the job of soft soldering type slugs to type bars on typewriter segment assemblies, up went production 100% at Commercial Controls Corporation, Rochester, N. Y. And a pull test for measuring the force needed to separate the pieces also showed an increase. This quality improvement factor was an unexpected bonus.

The reason for the production jump became evident when the type bar and segment assemblies were checked on the comparator. Formerly, the force of the gas flame had apparently forced slugs out of position during soldering. This meant the operator had to spend time aligning the type on the comparator. Now no alignment is necessary.

Bakes Up Meters

"Most attractive" describes the new meter assembly area at Federal Pacific Electric's plant in Newark, N. J. Walls, ceilings, and posts are pastel-colored. Cheerful, homelike drapes cover the windows. And well-chosen paintings on the wall make working in the area pleasant, relaxing, and productive. Before refurnishing, this production area had been a machine shop.

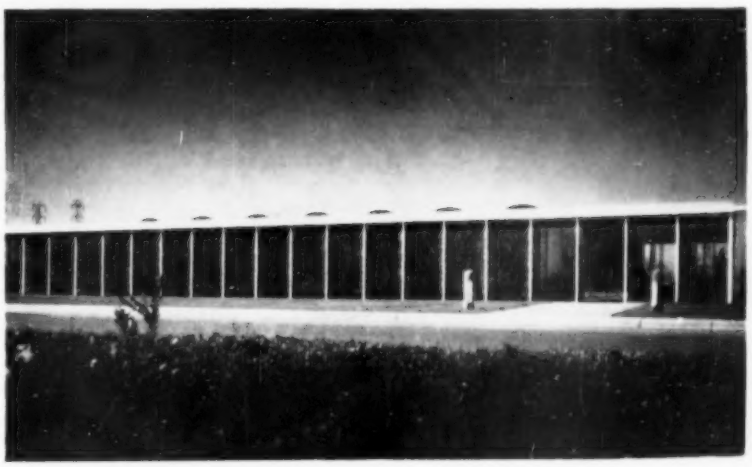
Ovens, right out of a dream kitchen, help women assemblers feel even more at home. Federal Pacific's designers found that consumer-type electric ovens were suitable and economical for glue-setting. So they built the ovens into steel frame cabinets matched in size and color with the assembly desk-benches where the girls work.

Operators apply thermosetting glue with microscopic-sized brushes to meter pivots, then mount them in the meter mechanism. When a rack of pivots is ready, it's placed in the oven. Dials are set for 300 to 375 F. When the timer bell rings (just like the one at home), operator removes the rack and places it in another cabinet at the rear of the oven. Leakage heat from the oven keeps this compartment above room temperature, prevents moisture from collecting on precision parts.

New Salary Plan

Thompson Ramo Wooldridge, Inc. (Cleveland), felt a need for more uniformity in its foreman salary system. Result was a two-year study that brought about changes in job titles as well as pay. In the new set-up, a unit foreman has about 20 men under him. A group foreman supervises at least four unit foremen. And a general foreman supervises at least four group foremen.

There's a salary range for each classification. It is related to the highest base rate the foreman supervises. Each range includes a "position rate." That's the salary an experienced, capable supervisor in the position can expect to earn.



COPPER GRILLE HUSHES TRAFFIC NOISE

If the sounds of continuous lines of traffic outside your plant hamper maximum efficiency, copper grillework might alleviate the situation. At the new plant of Dux, Inc., in San Francisco, copper screen deadens sounds from a nearby freeway. And it also creates an unusual design effect for the front of the building. In addition, the screen, designed by Martin Metal, filters light to give a pleasant visual effect to the offices behind. The grillework, combined with a colonnade and an inner fixed glass wall, also provides privacy.

YOU BE THE ARBITRATOR

THE CASE OF

The Unexpected Accident

Out of the experience of the American Arbitration Association

In early March the company gave Joe K. and seven other fuel truck drivers one week's notice of a layoff due to lack of work. But just two days before the layoff date, Joe was involved in an accident. This incapacitated him for nine weeks. Since injury was occupational, as defined in the union contract, Joe expected to get half his regular wage for the whole period of his disability. But the company didn't see it that way.

"The contract says we have to pay for 'lost time'," explained the personnel manager. "You're losing time only until the layoff date. After that date, any time you're off work is due to slack work, not to your injury."

"Lost time is lost time," answered the union business agent. "If it weren't for the accident, Joe would be able to work for another company until you get busy again. This means you have to give him disability pay as long as he's in no condition to work."

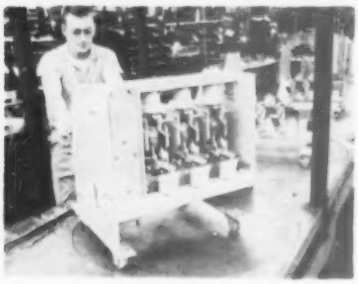
Eventually the case went to arbitration. Suppose you were the arbitrator. How would you rule?

For the actual decision turn to page 120

Product Displays Spur Workers

"What happens to what we work on after it leaves the shop?" That's a key question many employees ask. B-I-F Industries (Providence, R. I.) answers it by posting, in the plant, huge photos of product applications and installations. As a result, work becomes more meaningful and quality demands appear more reasonable to employees.

B-I-F gets additional mileage from its photos by moving them progressively from trade shows to plant lobby, to board room, to office, to shop. Shop damage and soilage is a problem that's solved by mounting photos in glass cabinets or covering them with plastic. Idea is inexpensive, yet effective.



No Storage, No Heavy Lifting

Lazy susan worktables (foreground) and gravity conveyors (behind operator) aid handling of big high-voltage contactors in a 1000-sq.-ft. area at General Electric's Industry Control Department (Roanoke, Va.). The system speeds assembly, eases handling of heavy, plate-steel contactor frames, eliminates storage of parts and subassemblies.

Parts and subassemblies come via toteboxes from other manufacturing areas. Some come directly from receiving. If parts are fairly large, they're dumped on the conveyors; if small, they're left in toteboxes while riding on the conveyors.

There are 9 turntables, 5 worktables in an area served by 50 conveyors (21 conveyor systems averaging 3 tiers high). Stations are equipped with tools, trays of fasteners, other hardware. Workers assemble light parts and subassemblies at their benches; then turn to lazy susan worktables and install subassemblies in the heavy steel frame, rotating the tables as needed.

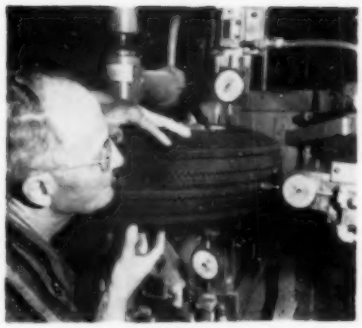
Heavy frames mounted on casters arrive by conveyor from stockroom. When an assembler has installed his parts on the frame, he rolls the partly completed assembly off his lazy susan onto the next. At end of the line a hydraulic platform lowers completed contactor to floor.

High-Heat, No-Air Brazing

Figuratively, working in a vacuum is highly undesirable. But literally it saves money at Grumman Aircraft Engineering Corporation (Bethpage, N. Y.). The plant has equipment for production scale brazing of honeycomb structures under vacuum. This eliminates use of inert gases. The new system also does away with the need for making costly and time-consuming welded envelopes to enclose work.

The process, evolved by F. J. Stokes Corporation, removes many residual surface contaminants (through evaporation) as a result of 2100-F. temperatures and high vacuum. Equipment accommodates panels of over 50 square feet.

ISOTOPES CHECK ROW STOCK



ELECTRONICS FINISH TIRES

New Methods Control Quality

To control tire quality, the Goodyear Tire & Rubber Company is using new techniques monitored by nuclear seeing eyes and electronic brains. The automatic inspection equipment installed at its five tire-building plants cost $6-million. But though advanced, these inspection techniques still have one-track minds. Their only "thought" is to check dimensional precision of tire materials with increased accuracy.

The nuclear instrument in widest use at Goodyear maintains uniform thickness of tire cord fabric as it's covered with rubber during calendering (photo, left). Beta rays from Strontium 90—or other radioactive by-products of nuclear reactor ash —pass through the rubberized tire cord and are intercepted by an ionization chamber. Conversion of the beta rays to electrical signals records thickness of the finished rubber-fabric sheeting.

X-ray and fluoroscope machines also are used to make spot checks on internal tire construction. A picture can be made for short-time study on re-usable photo-sensitive metal plates that hold an electrostatic image when exposed to radiation. Regular x-ray film makes pictures for permanent records.

After finished tires are taken from mold, they're wobble-tested, or checked for roundness, on a machine with three gage arms (photo, right). Electronic contacts made at the tire tread center and in the middle of each sidewall "feel" and record the tire's shape as it's rotated. If shape is only 50-thousandths of an inch off, it fails inspection and is rejected.

Development of radioactive isotope and electronic measuring and control devices permits the continuous production of rubberized tire cord of uniform thickness, perfectly "round" tires, and accurate tread profiles. Obtaining this high precision with difficult-to-control rubber compounds and fabric helps Goodyear improve tire design.

Photos Prove Product Changes

Photos are an integral part of the product records at Schramm, Inc. (West Chester, Pa.). All modifications of each product, even minor ones, are documented with pictures.

A photo tag is attached to any model that needs its portrait taken. The tag assures that picture will be made and that required details will be shown. Design, assembly, and shipping departments never release item until picture is taken.

Photo records of special assemblies (machines modified to customer's specifications) eliminate the need for remaking costly engineering drawings. Also, the sales force gets copies to show customers the latest models—this helps customers visualize improvements.

Contributions from readers reporting experiences will be welcomed. No need for fancy writing; just a clear, concise statement of facts. If you have photos or drawings, be sure to include. We'll edit for the Case Book. Contributions accepted will be paid for at time of publication. Address: Case Book Editor, FACTORY, 330 West 42nd St., New York 36.

CASE BOOK CAPSULES

Continuous casting of aluminum by a new process permits Kaiser Aluminum & Chemical Company (Oakland, Calif.) to produce slabs with close dimensional control at high speeds in various sizes.

Concrete cutting tool is clearing the way for construction of the S.S. Abraham Lincoln, nuclear powered submarine, at Portsmouth Naval Shipyard (Portsmouth, N. H.). Linde Company's OXweld ACL-3 pierces or cuts most known substances with a powder lance.

Electronic computer for reading and writing English can be bought or leased from Burroughs Corporation (Detroit). This visible record unit selects and writes on individual account records.

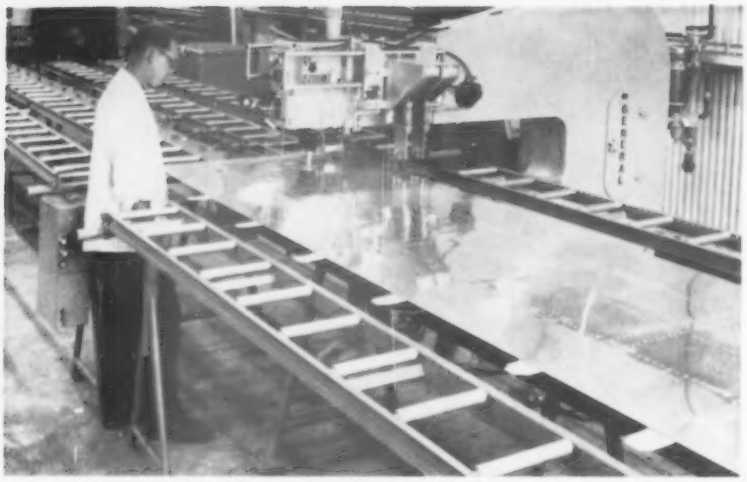
Sound is being tested to eliminate porosity in non-ferrous die castings by American Charcoal Company (Detroit). Sound waves shake molecules together at the instant molten metal becomes solid.

Chemical hydrate emulsion formula reduces fire hazards due to gasoline or oil spills. Developed by Penetone Company (Tenafly, N. J.) and used as an anti-coalescing agent, Slix coats oil, can be washed away with water.

Architects can choose from 47 basic colors in planning porcelain enamel curtain-wall construction, says Porcelain Enamel Institute, Inc. (New York). This is first time industry-wide standard color sources have been available.

Fuel cell powered experimental tractor has been developed by Allis-Chalmers Manufacturing Company (Milwaukee). Converts propane gas directly into 15 kw. to give 3000-lb. draw-bar pull.

Cart assemblies for preloading baggage will speed transfer of luggage on United Air Line's DC-8 Jet Mainliners. Blackwelder Manufacturing Company (Rio Vista, Calif.) has turned out 721 of these devices for the airline.



FASTENS RIVETS WITH MACHINE-GUN SPEED

This machine does three operations at once. And it does them several times faster than by any previous method, with no resulting loss in quality. First, as 22-ft.-long fuselage panels glide along a 60-ft. worktable at Rohr Aircraft Corporation (Chula Vista, Calif.), the machine drills and countersinks holes in one continuous operation. Then, as rivets drop from a pair of pneumatically operated hoppers, a mandrel comes into place automatically and peens them. A notched bar actuated by a torque motor guides the operation and insures perfect alignment of each part. Set-up is versatile—can handle a wide variety of riveting jobs with a uniform degree of speed and accuracy.

Up, Down, Sideways

Maintenance men roll merrily along as they paint the exterior of General Motor's Fisher Body plant in Hamilton, Ohio. They lower and raise the scaffold themselves. If they want to move to the right or to the left, they just signal a helper on the roof to give the rubber-tired rigging a push. As the rigging rolls along the building's edge, so does the scaffolding.

Result is a time-saving, more efficient method for moving scaffolds from one work area to another. The movable roof rig consists of a simple angle-iron frame with four pneumatic tires mounted on each side. Portable counterweights make sure the scaffold, suspended from two cantilever arms extending over the edge of the building, is safely secured. When painting is completed, the roof rig is dismantled and lowered by block and tackle.

Originally a stationary rigging on the scaffold was counterweighted with sand bags. Thus any sideways movement meant lowering the scaffold to the ground before the rigging could be repositioned.

Camera Reduces Drafting Costs

The amount of time and money it spent making production drawings of prototype models—produced without drawings in the first place—seemed a great waste to Acoustica Associates Inc. Actually all they needed to get into production on most models was a labeled picture of the prototype.

So Acoustica decided to try 4x5-in. view camera photography to solve the problem. The choice was a wise one. Once it took one and one half weeks of tedious drafting to produce a working drawing of the model for production. Now, a precise detailed photo, complete with parts callouts and assembly instructions, is produced in just two days. And the cost is only $60.

Photos are taken of the unit in three views—top, front, and bottom. Unwanted background is opaqued from the resulting negatives. From the negatives Acoustica makes 8x10 (or larger) prints. Photographically the picture of the unit is then superimposed on a print of a standard Acoustica format sheet. When the completed negative is printed on a Mylar (polyester film) master, callouts are drawn in. Corrections on the Mylar master can be made with special eradication fluid. Final format sheets are reproduced on a photocopy machine in any desired number and distributed to the production supervisors.

Source: Herman Bronson, Chief Draftsman, Acoustica Associates, Inc., Plainview, N. Y.

Reprints of the Plant Operating Case Book are available. Price 50c. For quantity prices write Reader Service Department, FACTORY, 330 W. 42nd St., New York 36.

Speeds Small Parts Tests

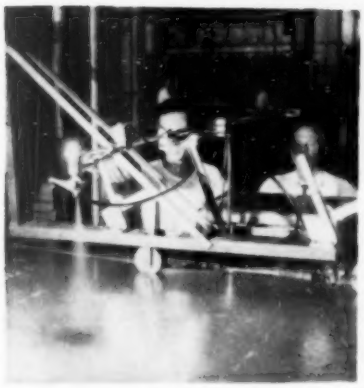
Keeping track of data on small components as they go through successive tests isn't easy. Especially when comparison of results of one test against others determines acceptability. But engineers at Hoffman Electronics Corporation's Semiconductor Division (Evanston, Ill.) have speeded up testing some 800%. One operator can now test 300 diodes in 30 minutes where it once took six operators 40 minutes.

New racks (photo) each hold 50

zener diodes (used as extremely accurate constant voltage reference sources). Each diode must be tested for voltage drops at −55, +25, and +100-deg. C. Operators insert racks in successive oil baths corresponding to these temperatures. After temperature stabilizes, a new automatic test console checks voltage of each diode, prints the data on an adding machine tape. After tests are completed, tapes from the three tests are compared. Diodes with a total drift exceeding 45 millivolts are rejected.

QUIET, SHOUT THESE CRAGGY WALLS

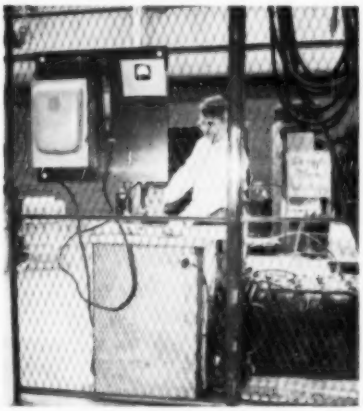
Looking more like a medieval torture chamber than an instrument of modern science, these craggy walls are actually part of one of the quietest rooms in the world. Even the ceiling and floors of this king-sized "anechoic chamber" are covered with glass-fiber wedges, to dampen all sounds and echoes. Reason for all the quiet? Federal Sign and Signal Corporation (Blue Island, Ill.) needs it to test the many types of signals it manufactures. Everything from tiny buzzers to giant air-raid sirens get the silent treatment here. This is one of the outstanding features of the company's modern 164,000-sq.-ft. single-story plant. All other production, testing, and research operations have been streamlined at this new location, too.



Dye Pinpoints Bad Sections

A squirt from this home-engineered machine brands imperfections in sheet steel. It also means the piece it's passing over automatically goes to the scrap heap. This reliable ultrasonic detection method saves Chrysler Corporation thousands of dollars monthly by reducing rejected body stampings at its Nine Mile Stamping Plant near Detroit.

The inspection system uses sound waves to scan sheets of steel unwinding at over 200 fpm. Dirt and other impurities cause the signal to change from its pre-set pattern on the machine's visible scope. The flaw is then sprayed with bright purple dye. Prior to using this inspection system, Chrysler stamped out parts before it discovered sheets were faulty. Despite discouraging reports from electronic scientists who said it couldn't be done, a Chrysler employee researched this project. Engineers from Sperry Products, Inc. (Danbury, Conn.) collaborated to produce the device.



Takes the Punch out of Batteries

Looking for an easy or better way to discharge truck batteries before you rebuild them? Then heed this tip from the buildings and grounds department at General Electric Company's Industry Control plant in Roanoke, Va. The department built its own discharger.

The unit is a tank-contained brine bath. One conductor is bonded to the steel tank. The other, connected to copper bus, can be lowered in the bath. The bus is connected to the battery through a 100-amp., 250-volt safety switch and an ammeter. Immersion depth of copper bus (with rough calibration marks on side) governs rate of discharge.

20% Fewer Guards

The guard force was reduced 20% at the U. S. Naval Engineering Experiment Station (Annapolis) after a methods examiner took an analytical look at the guardbook. Savings? Over $15,000 per year.

In a traditional fact-gathering session the examiner first accompanied the guards on their rounds, asked questions, and studied the security regulations. Seemingly the guard force could be reduced. But there were few facts to back up this opinion. Here's where the guardbook came in. All noteworthy, recurring incidents recorded in the book were given code symbols. Typical entries included windows open, door unlocked, lights out, lights on, truck breakdown, safe open, and admittance of employees.

These symbols were next plotted on a "scattergram," an informal

correlation technique borrowed from personnel testing people. Using the hours of the day as the vertical axis and the days of the month as the horizontal, a chart was constructed. As symbols were plotted in the appropriate locations, a relationship evolved between certain hours and degree of activity. Guards were busiest, by far, from 4:30 to 5:30 in the afternoon. This was the time for turning off lights, turning others on, watching for hot plates left on, noting doors that needed to be locked. The pattern proved remarkably consistent when checked over a 10-year period.

These were the facts the examiner needed. They proved reductions were possible during slow hours while more help was needed at high-activity periods. In the new schedule, shifts overlap so an extra man is available between 4:30 and 5:30 P.M. After a three-month trial, the change from a 15-man force to 12 was made permanent.

Source: M. F. Ronayne, Management Analyst, Middletown Air Material Area, Pa.

Drafting Time-Saver

Drafting time has been cut 75% at General Electric's Specialty Control Department. The reason: An automatic programer that speeds the production of program tapes from dimensionless engineering drawings. Human hands are used only in loading and unloading workpieces. (The programing device was initially used for production of parts on a giant tape-controlled punchpress at the Waynesboro, Va., plant.)

The device works this way: After a rough layout has been outlined, it's secured to the programer worktable. A foot switch lets the operator transfer dimensions, as measured by a locating device, from the layout to storage and read-outs. Then the information is punched on tape. Simultaneously, the center line is marked on the layout to prevent repeating holes.

A transparency is then made. After part numbers and a drawing number have been added, this becomes an assembly drawing. Then a duplicate tape and specification sheet are produced from the tape as a check against errors.

Guards Secrets

This is the interior of a new electronically operated door system. It provides 24-hour protection without a guard at the entrance to the quality assurance and test services lab of Lockheed Missiles Systems Division, Sunnyvale, Calif. Authorized persons can enter—one at a time—by punching a correct combination of buttons and inserting an invisibly coded, billfold-size, pass card in a slot. The electronic sensing system permits a quick change of combinations and a selection of combination complexity according to protection needs.

Securiti-Booth fits into a door casing or similar entry opening. When a person enters, the outer door locks behind him (or her). Then he inserts the card key, presses right combination of buttons, and inner door unlocks. If he pushes wrong buttons or uses the emergency, he can exit by breaking the emergency glass. However, entry is never possible by breaking the glass.

The booth (manufactured by Card-Key System, Burbank, Calif.) has an all-steel construction, weighs 450 pounds. Can be installed and in operation within two hours. It works on 110 volts and 24 volts a-c, or automatically switches to 14 volts d-c battery operation in case of plant power failure.

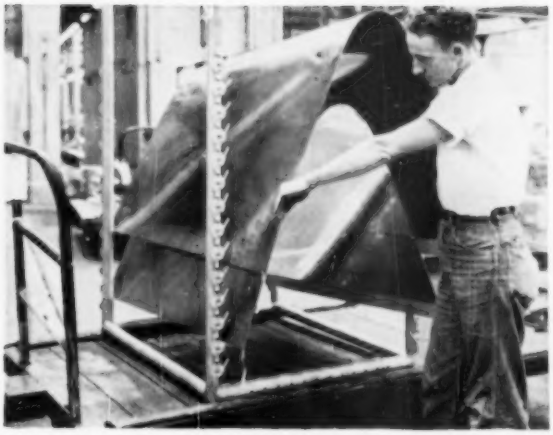
Gives Better Parts

Faster production, increased accuracy, and savings in time. Those are the benefits Synthane Corporation (Oaks, Pa.) gets in the fabrication of laminated plastic parts by using a high-speed, vertical wet sander. The machine (Sunstrand-Engelberg, Ann Arbor, Mich.) meets varying finishing requirements by using belts with just the right grit size.

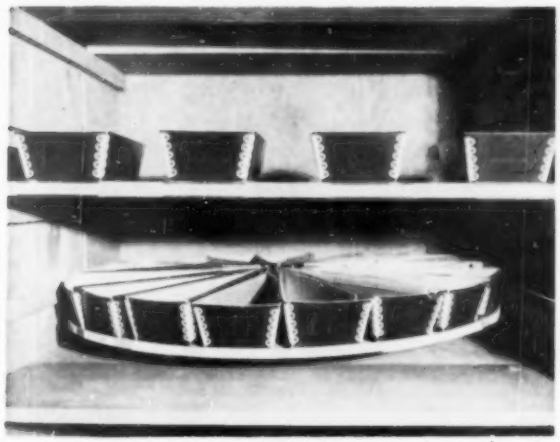
Among the principal units made by Synthane and finished on the platen-type sander are rotor vanes for compressors, air tools, and motors. Held to tolerances as close as 0.002 inches, the rotor vanes can be quickly and accurately shaped with the sander. Same for canvas-based knife cushions of phenolic Synthane. The cushions, used extensively by the printing industry for cutting paper, have a 63 micro-inch finish.

Grinder is at least 10 times as fast as hand sanding, and offers invariable accuracy—an objective impossible to get with manual sanding. Synthane uses the wet abrasive belt sander because it provides dimensional accuracy, improves product appearance, and assures reliability. Tolerances held to 0.001 are not unusual. Operator chooses aluminum oxide belts with grits from 30 to as high as 600 for different parts. Belt life varies from eight hours to six days. A 4% water-soluble oil coolant prevents burn marks on parts and clogging of the belt; stops rust on fixtures, table, and grinder working parts.

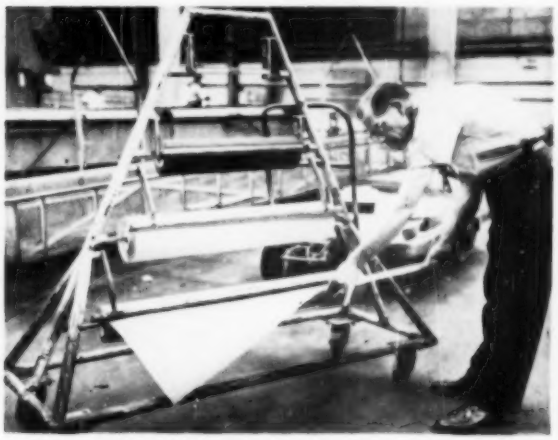
1. HULA HOOP GETS PARTS OFF GROUND.



2. NO-SCRATCH RACKS SAVE $15,500 MONTHLY.



3. LAZY SUSAN TWIRLS DELICATE PARTS.



4. ROLL-YOUR-OWN FROM MOBILE RACK.

Small Ideas Help Big Company Save Money

If you can build a better mousetrap, you can do a better job. Operators at both the Georgia and Sunnyvale Divisions of Lockheed Aircraft Corporation have been putting this fractured quotation to work. The four improvements shown above and described below are samples of the results. In one instance, savings added up to $15,500 a month. Perhaps one or more of these "better mousetrap" ideas can go to work for you with equal success.

1. Hula hoops. They don't fly with the greatest of ease, but modified hula hoops do roll well during cutting and welding operations at Lockheed's Sunnyvale plant. So well that one man can rotate the Polaris missile container, suspended in the ring, through a full 360 degrees. It used to take two to four men to reorient these containers.

Rings of salvage pipe are formed and welded into a large circle to surround the container. Then plates are welded to the circle. These in turn clamp onto container with pins to prevent slippage. When hoop is removed, welder seals pinholes and job is finished. Cost of materials was negligible. But saving in man-hours is considerable.

2. No-scratch racks. The $150 price tag on these metal skins for aircraft wings calls for kid-glove handling at the Georgia division. A slight scratch on the smooth aluminum surface turns the piece into scrap. And the danger of scratching goes through three production phases. Sheets are picked up from the rolling operation, taken to a heat-treating oven for age-hardening, then carried to the paint shop. Rejections used to average 100 per month. Cost to company: $15,000.

The new racks, designed by Lockheed, prevent scratches. They also save an additional $480 monthly on wrapping paper formerly used to protect skins during production moves. The racks are made of tubular aluminum, hold 14 sheets on adjustable pins—with ample clearance between for air circulation. Horizontal perforated tubes of rack telescope from 26 to 48 inches to accommodate sheets of various widths while rack length remains constant at 36 inches. To hold extra-long sheets, two racks are placed side by side.

Lockheed has only 12 racks, cost-

ing $100 each, in use at present. Some skins are stored on them after painting, but most racks return to production line after completing the cycle. When more racks are available, Lockheed plans to use these units to store the metal skins.

3. Lazy susan. No *hors d'ouevres* are served on this kitchen-like lazy susan. But operators at the Georgia Division are none-the-less pleased with the fixture. It makes the retrieving of minute, expensive jet aircraft parts much simpler.

In all, 21 (15-in. long) pie-shaped trays ride on a circular plywood base. Take up the same 3-ft. square shelf space that used to hold four oblong trays (upper shelf, photo). No more wasted space behind trays or time lost in reaching for parts on overhead shelves. No new parts were needed to build the gadget. Old oblong trays were converted to pie-shape by stapling one end.

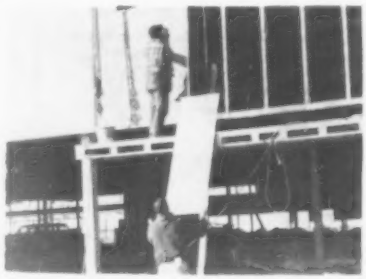
4. Roll your own. Paper and other rolled materials needed in the machine shop go right to the point of use with this rack on wheels. It was home-engineered at the Georgia Division to hold four rolls varying in width from 60 to 12 inches. This mobile unit replaces stationary material holders.

Two bottom rolls hold wrapping paper for delicate machined parts. Third roll is abrasive material while fourth is held vacant for special rolls. Pyramid-shaped frame of 1½-in. tubular steel gets its cutting bars from two sources. Bottom two are weights taken from an old paper holder. Other two are flat pieces of steel held against roll by a ⅜-in. spring and plunger on each side of bar. Cost of rack: $125.

Air Outlet Costs Slashed

Use of over-the-floor raceways for compressed air lines reduced air outlet installation costs 70% at International Business Machines' Poughkeepsie (N. Y.) plant. Old practice was to drill through floors, pick up compressed air from ceiling of floor below and use ¼-in. pipe to get air service to each assembly bench or machine.

Using floor raceways, the company runs one ⅜-in. OD or two 5/16-in. OD soft copper lines side by side on the floor. Takes off branch lines as needed at each bench or machine. In addition to the time saved in eliminating hole drilling, there is a 50% saving due to use of compression-type fittings instead of threaded pipe.



Wall Goes up the Fast Way

Field-assembly of an insulated aluminum curtain wall saved an estimated 30% in labor costs over other methods. Curtain wall is part of Fuller Brush Company's new warehouse (East Hartford, Conn.). Its 28,000 square feet of wall area has factory-painted glass-fiber insulation exposed on the interior and an exterior of aluminum sheeting.

Approximately 13,000 studs, end-welded to girts on 8-in. centers, secure elements of the insulated wall. The studs, 5/16 inches in diameter and 1¼ inches long, were welded with the lightweight welding gun. The technique was developed by Nelson Stud Welding Division of Gregory Industries.

Besides reducing costs, this type of wall provides thermal efficiency and an attractive interior. The glass-fiber board-type insulation, without further treatment, forms the interior wall of the warehouse.

The galvanized impalable tee bars, or batten strips, are 16 feet long, span three girts. Tee bars are spaced on 24-in. centers and impaled on the studs with a rubber-end hammer. The 1-in. insulation sheets were placed between the tee bars, then pressed over the studs, and held in place with speed clips. Finally, ribbed aluminum sheets, 0.032 inch thick, were also impaled over the studs and the studs capped to hold elements in place.

YOU BE THE ARBITRATOR

Continued from page 114

The award—In the absence of concrete evidence to the contrary, the arbitrator presumed the parties were seeking to compensate Joe for wages *then in sight*, which he lost due to injury. He further presumed there were no wages then in sight beyond those *this company* would have paid. It was also clear that these would cease at least for the summer, with the employee's layoff. However, the arbitrator admitted this was not the only possible interpretation. But it was his best judgment in a situation where there was "a most unfortunate lack of concrete evidence on contractual intent."

Caution: The award in this case is not an indication of how other arbitrators might rule in other apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony, and other facts involved.

Flip-Top Guard

Production test instruments fit snugly into uniform-size open-top wooden boxes at Magnetic Amplifiers, Inc., New York. Box protects the meter and case from shock and damage while in use and on periodic trips to the calibrating laboratory. Meters can't fall or tip forward because they're held by a lip along front edge of the hinged top.

At the bottom of each box a jack plug is mounted in an adapter plate. This makes meter connecting faster. And there's no possibility of a wrong polarity hook-up when meters are connected to test jigs.

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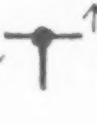
If it rolls on an axle or turns in a bearing or rides on a shaft if it slides in a groove or moves on a pivot  if it bores or cuts or transmits pressure

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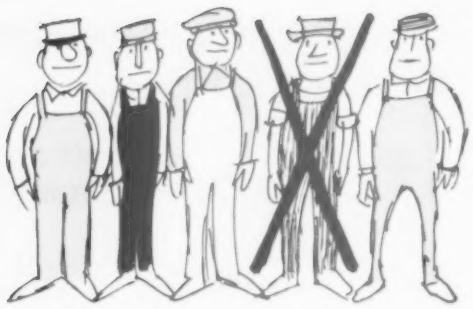


20% Just Don't Belong

The old gag that plumbers are always assigned as cooks on entering the Army is no joke when applied to private industry. One out of five workers hired by American business is unsuited to the job assigned to him and has to be discharged, according to Dr. Robert N. McMurry, industrial psychologist. Dr. McMurry made a survey of 901 companies.

What does this mean in terms of money? Plenty! One firm with 1000 employees hires about 100 men annually. During a typical year the company had a dead loss of $149,377 due to misplaced employees.

More than half of this type of loss is avoidable by correct hiring procedure says ICR Corporation, affiliate of International Publishing and Management Services Company, sponsor of the research.

Mental Accident Hazards

Are accidents accidental? No says Dr. Karl Menninger, psychiatrist. The number of accidents caused by pure chance is well below 15%.

Checking 25 persons injured seemingly through pure chance, all but a couple had instances of provocation, frustration, disappointment, etc., just prior to their accident. Beware the factory worker who wakes up in the morning saying that he doesn't feel very well and that nobody had better get in his way. Tease him, or hurt him a little bit during the day and your company is going to have losses to pay.

Mental attitudes that lead to accident proneness are generally destructive impulses, as above, or self-punishment impulses, where a worker's subconscious might generate self-harm because of a guilt complex.

People who periodically are laid up by accidents are regarded as ill by psychiatrists.

A person's level of accident proneness varies from day to day depending on a number of variables: weariness, a series of disappointments, and the like.

Unhappy Professionals

Scientists and engineers are a pretty disgruntled lot, according to a recent study by Opinion Research Corporation (Princeton, N. J.)

What's the trouble? For one thing, money! Four out of five complain they are underpaid compared with others with similar training and responsibilities.

Perhaps even more important, the survey shows a basic conflict of interest between company policy and their own ideas. For example, 74% of those interviewed picked sales and profits as the primary goals of their firms, yet fewer than half shared these goals.

About 72% complained management was misusing their skills, while the same percentage said they were being forced to overspecialize. Two out of three complained that the way to the top in their company was through politics rather than talent.

Only one out of four believed corporations gave them freedom to work in their own way. The demand for immediate results, schedules, budgetary considerations, and pressure to conform to tradition in solving problems were other annoyances.

Travel the Safety Route

Heavy traffic passing through school areas on the way to and from a large industrial plant presents a definite accident hazard.

This problem has been pretty well licked by means of a safety route at North American Aviation's Santa Susana Mountain (Calif.) laboratories.

The company mapped out a route that steers clear of the city schools. All company vehicles are required to use it. Each employee of the firm receives a copy of the route and is advised to follow it driving from town to work. Suppliers to the plant are also asked to use the route when making deliveries.

The route is the fastest as well as the safest from city to factory, says North American.

Letting Labor in on It

"How can I make them understand what I'm up against?" Many an employer faced with excessive labor demands wonders if there is an answer to this.

"Yes," affirmed Richard P. Brown, vice president of General Time Corporation (New York), speaking to the American Management Association's 1959 Fall Personnel Conference. By presenting the economic facts of life to your workers in a straightforward manner, you can show them that their interests are the same as the company's in the long run. But you're licked before you start if you intend to hedge on touchy points. You have to discuss the facts they want examined. Just repeating what's in the annual report won't do it, says Mr. Brown.

One method is to dramatize your problems to your employees. For instance, show them products of foreign competitors selling at cheaper prices.

Stressing the Man

In this era of mammoth corporations, the worker is gaining rather than losing stature as an individual in the eyes of management. The idea of mass programming is giving way to the man-centered program, according to Dean James L. Hayes of Duquesne University, Pittsburgh (addressing the recent annual convention of the National Metal Trades Association).

As a result of this shift of emphasis, management is depending more on line than on staff personnel for development of the individual worker. Though staff personnel will always be needed in this field, there is no substitute for the guidance a supervisor can give his immediate subordinate, Dean Hayes stated. The supervisor alone is in a position to motivate the worker. This return to the stress on the individual is what Dean Hayes calls "the most significant trend in management development.

Climate for Change

Creating proper climate for change in your plant can be a touchy job. James N. Gorringe of Esso Standard Oil Company has set up this three-point program to make it as painless as possible:

1. Notify the supervisor first. He can strengthen management's hand in gathering acceptance.

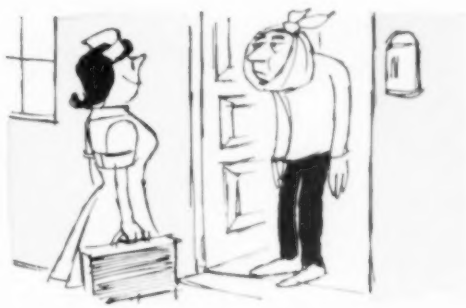
2. Get union participation. Permit discussion, but don't let the union maneuver itself into a position of public commitment against the program.

3. Don't try to hand the workers trite sayings, such as "change is good." Instead, try to get employee reaction ahead of time, and minimize the unpleasantness by being honest with your workers.

Muzzling the Money Bite

The traditional recoil every time the plant samaritan comes around announcing that "Mr. Throckmorton's wife just gave birth and wouldn't it be nice if we . . ." is a thing of the past at Datex Corporation (Monrovia, Calif.). The gift bite is being absorbed by the company, thus relieving a sore spot.

The firm had received reports that collections were often a disagreeable chore, with some contributions not exactly from the bottom of the heart. Now the company's purchasing personnel department selects and buys—with company funds—an appropriate gift, which is presented to the new father, mother, or bride by a co-worker.



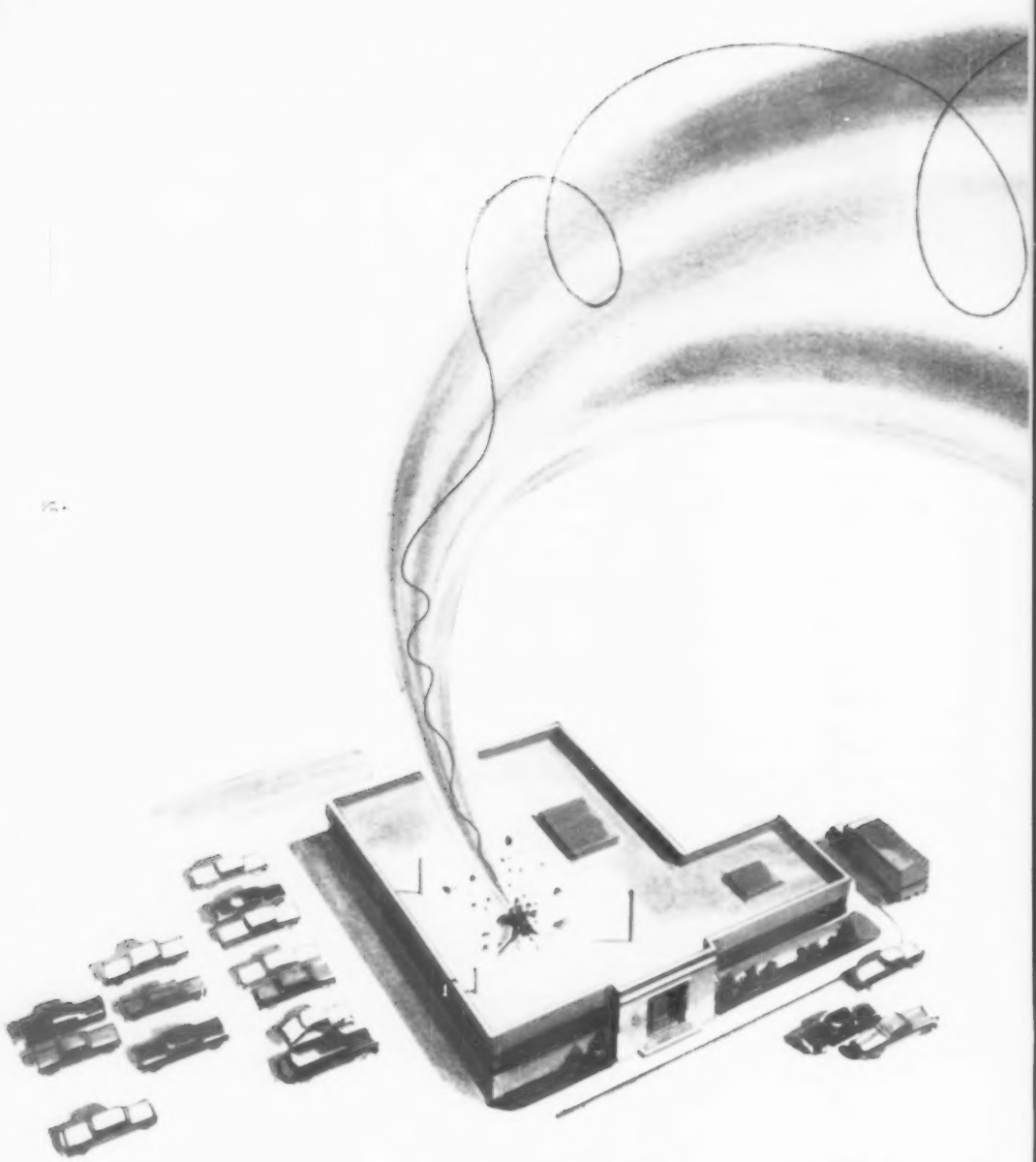
Medical Help at Home

Most large companies have a medical department at the plant, but at B. F. Goodrich Company (Akron, Ohio) the health program extends right into the home. Company nurses visit the residence of each employee who is away ill more than two days.

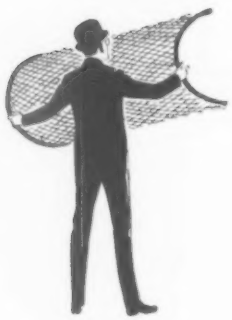
The service is paying off. Since the program was instituted late in 1958, absenteeism has fallen off some 12% among the 12,000 employees at the plant. However, this isn't the whole story. Intangible results such as increased morale have been noted, with workers feeling that the company is finally taking an interest in their physical welfare.

Visiting homes is only a part of the Goodrich out-of-plant medical program. One nurse makes calls on Akron area hospitals—not only to see employees and retirees, but their families as well. It's her job to explain hospitalization benefits and make arrangements for laid-up workers to get their pay.

What do chronically sick workers (at World Series time, that is) think about the program? Well, the declining absentee record shows these men are making miraculously quick recoveries.



The 80-lb. spool that



And how the friendly AM man's down-to-earth advice helped set up a vital safeguard for a "safety-conscious" policyholder.

The heavy spools on the cable-winding machine were whirling away at speeds over 1600 revolutions a minute.

Suddenly there was a loud "whoosh" as one of the spools spun from its cradle, crashed like a rocket through the roof, and plummeted finally to the street. Somehow the automatic locking device on the spool had failed. Fortunately, the only damage was to the roof. But to prevent a recurrence that could cost a life or limb, an AM Safety Engineer was called in. After study of the complete operation, and with his advice, a special guard

almost went into orbit!

was installed, equipped with micro-switches to instantly stop the machine if the guard is opened and to prevent its operation if the guard is not closed.

Unusual as this case was, it's not unusual for AM policyholders to profit regularly by teaming up with American Mutual Safety Engineers. In fact, over the past 5 years, this policyholder has enjoyed insurance rates 25.9% less than the average for the industry and further reduced costs through American Mutual dividends.

If such savings make good sense to you, why don't you call in the *friendly* AM *man*, too. Remember, he can advise you on all your liability insurance needs. American Mutual, Dept. F-7, Wakefield, Massachusetts.

American Mutual

LIABILITY INSURANCE COMPANY

"The First American Liability Insurance Company" . . . a leading writer of Workmen's Compensation, all forms of Liability, Crime, Automobile, Group Accident and Health Insurance.

FACTORY

IDEAS OF THE MONTH

By LEWIS K. URQUHART, Consulting Editor

(For more information, circle item numbers on Reader Service Card next to back cover)

Group relamping, as 'most everybody knows, substitutes mass production methods for haphazard replacement. If you still need proof, or have to convince "someone else," a new booklet *(Westinghouse)* shows how savings in labor costs far outweigh the shorter time lamps are in service. **(291)**

For the birds can obviously be said of a light *(Trippe)* with rotating colored beams. Seems the alternating light-and-shadow pattern keeps your little feathered friends up all night, provides the urge to move. **(292)**

Many a good tip to lower cleaning costs can be found in the new plant maintenance guide *(Oakite)*. Covers general plant work; cafeteria maintenance; air conditioning, humidifying, refrigeration equipment. Free, of course. So's Oakite's companion guide to floor maintenance. **(293)**

Airless spray-painting unit *(DeVilbiss)* is what the doctor ordered for many applications. Spray pattern has unusually sharp, clean edges. Masking and shielding on most "rough" work can be largely eliminated. **(294)**

They say Ultra-V drives *(Wood's)* can handle up to three times the horsepower of conventional V-belt drives occupying same space. Reason: compact packages made possible through high-strength belts and sheaves. **(295)**

Icy walks, drives, docks? Not if you were forehanded enough to add a self-propelled, power-driven salt-and-sand spreader *(Gravely)* to your battery of snow removers. It spreads from a 4- to a 25-ft. width. **(296)**

Top speed of 6.3 mph. is what you get with newest three-speed rider-walkie *(Yale)*. And operator can go into high only by stepping on a treadle on front end of truck. This is a safety device because third speed is faster than a normal walk, and operator is forced to ride. **(297)**

Omni-Reach is a handy-dandy scaffold-ladder-truck *(Atlas)* for all manner of up-in-the-air maintenance work. **(298)**

Heavy-duty conveyor belt *(Manhattan)* is designed for carrying all materials (not just light ones) over 45-deg. instead of the usual 20-deg. idlers. Which means bigger pay loads (see for yourself with neat demonstrator), lower initial cost, less space required, lower maintenance costs. **(299)**

For real sticktoitiveness and unusual abrasion resistance, why not give Adheron *(Hauger-Beegle)* a try? It's an aisle-marking compound (yellow or orange) based on a modified epoxy adhesive formulation. **(300)**

How to cut overhead underfoot is what they christened a floor care manual *(Advance)*. Gives you instructions not only for cleaning, but also for setting up work schedules and job-time requirements. **(301)**

Wherever a production lift is indicated, Porta-Lifts *(Autoquip)* might well get the call. They come in all sizes and capacities, lower to barely inches above floor when not in use, have flip tops for easy servicing. **(302)**

You have to see Tutor to believe it. It's a teaching machine *(Western Design)* that augments present-day training procedures by taking over the job of imparting information, at the same time grading work and timing performance. This leaves the teacher free for his true creative role. **(303)**

Hard-hat wearers are sure to like the new glass-fiber line *(Boyer Campbell)* with the high gloss molded *in* instead of polished *on*. Seems this makes hats scratch-, bump-, dirt-, and stain-proof. **(304)**

You'll find everything you need to know about sling-chain safety in a little kit *(McKay)* of five folders, including a ready-made safety program that covers inspection procedures, cautions, terms, working load limits, proper care and use of chain, and maintenance procedures. **(305)**

Get a Time Planner *(Barrington Assoc.)* if you'd like to plan 1960 trips, conferences, and other major activities on one sheet. Folds to 8½ by 11 in., shows 6 months at a glance. Free. **(306)**

When walk-or-ride power buggy *(Whiteman)* hits an uphill pull, lower drive ratio (down to 1:2½) takes hold for extra climb power. When going is easier, buggy moves into higher drive ratio (up to 2:1). **(307)**

Hi-Viz safety paint *(Lauter Chemicals)* comes in eight different fluorescent colors billed as four times brighter than regular safety colors, including international orange. Easy to brush, spray, or roll on. **(308)**

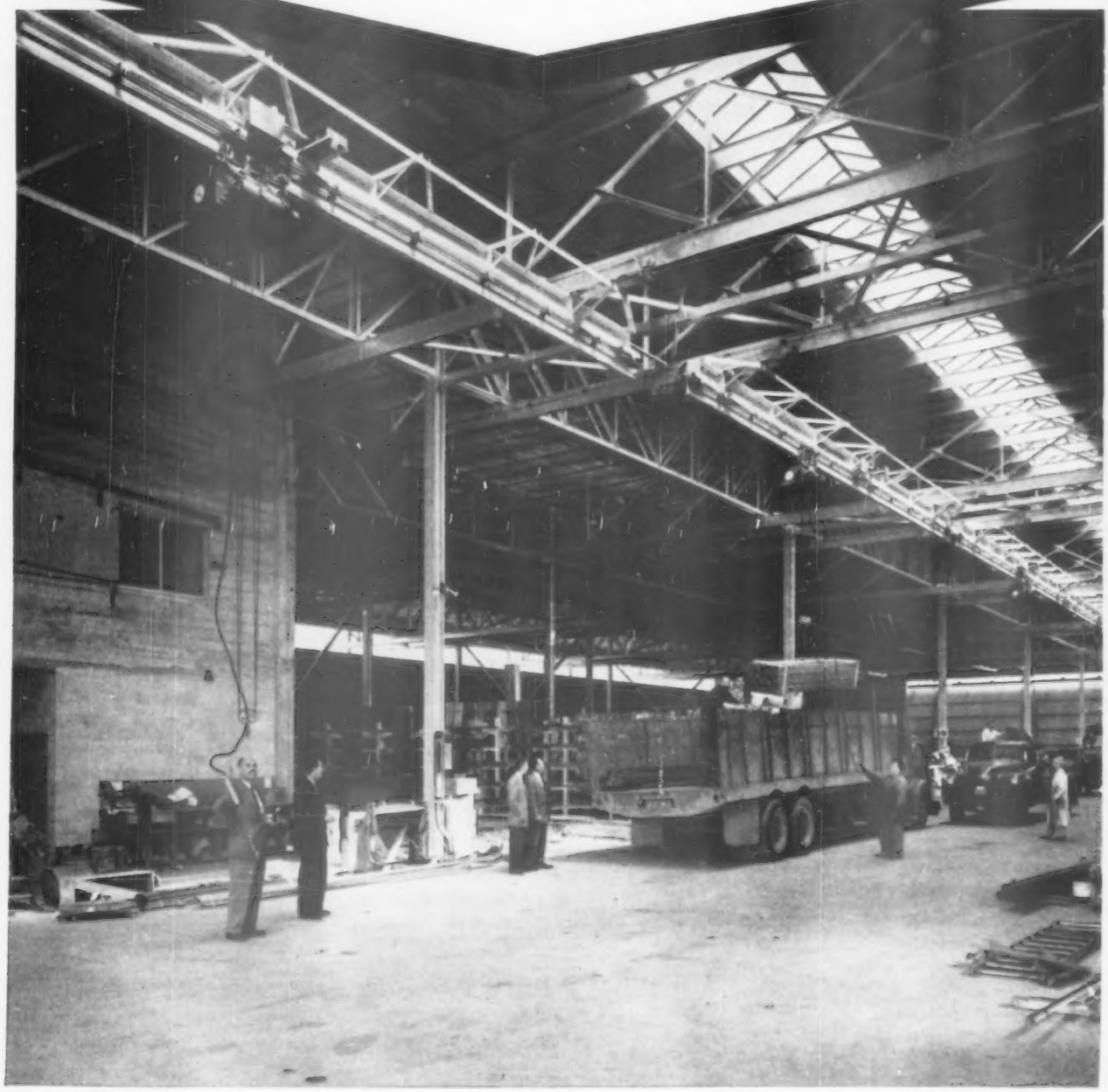
Torque screwdrivers, wrenches, etc., can be quickly checked with a deadweight beam torque tester *(Apco Mossberg)*. Table size, it weighs only 5½ lb., will test calibration of tools from 3 in.-oz. to 150 ft.-lb. **(309)**

Uncoiled length of self-storing air hose *(Synflex)* is approximately 20 ft. Coiled length is less than 1 ft. Won't kink. Absorbs twist. That's why men who use portable tools prefer it to the old-fashioned kind. **(310)**

Turn the page

AMERICAN MONORAIL DOES IT!

7 CRANES INTERLOCK...SPAN 6 BAYS ...340 ft. LONG!



What draftsman wouldn't like to find a shiny, new Rapidograph pen *(Koh-I-Noor)* in his Christmas stocking? It's a single holder with seven interchangeable point sections that provide seven different line widths. **(311)**

You production planners and inventory controllers who up to now haven't been able to take advantage of the speed, accuracy, and flexibility of punched-card techniques will welcome a new service *(Statistical Tabulating)* which offers the latest data-processing methods and equipment. **(312)**

Executives' Digest won't do all your reading for you. But it ought to help. It's a monthly 4-pager *(Mark, Simeon, & Renard)* containing quick summaries of timely articles you wouldn't want to miss. Free. **(313)**

For handling steel plate. barrels, stone, etc., don't forget Pad Pac *(Vac-U-Lift)*. Standard unit is 18 in. high with 16-in.-dia. pad and neoprene seal ring. Lifts 1200 lb. in horizontal, 600 in shear position. **(314)**

Add to your list of self-contained fire alarms the UL-approved, Freon-powered job *(Falcon)* with the sight glass that enables you at a glance to check the level of the liquefied gas (to which coloring has been added). **(315)**

Turn the page

AMERICAN MONORAIL CAN DO IT FOR YOU!

Here's a metal distributing warehouse with no unloading docks! American Monorail cranes unload directly from an indoor railway siding along one wall and a 3-lane truck driveway thru the center of the building. Seven American Monorail cranes work in six parallel bays at loading or unloading.

Transfer of loads from bay to bay poses no problem. **All cranes interlock at fixed transfer points to allow swift transfer of stock to any point in any direction** throughout this 340 ft. x 300 ft. warehouse!

A Monorail system can be tailor-made for your plant from standard parts. Write now for free literature.

AMERICAN MONORAIL

1114 E. 200th STREET
CLEVELAND 17, OHIO

MEMBER OF MATERIAL HANDLING INSTITUTE AND MONORAIL MANUFACTURERS ASSOCIATION

IDEAS OF THE MONTH . . . *Begins on page 128*

(For more information, circle item numbers on Reader Service Card next to back cover)

Best staplers yet for big jobs in the plant office are (we think) two new Bostomatics *(Bostitch)*. One's fully automatic, staples being driven when work (up to 36 sheets of 16-lb. bond) is inserted against combination back gage and switch release. The other's foot- or knee-operated. **(316)**

For background music in the plant, there's Moodmaster *(Conley)*. One-reel-tape magazine plays up to two hours of "mood" music. Lots of moods to choose from. No commercials or breaks, of course, between selections. **(317)**

Mixing paint, putty, mortar (if you must) isn't too tough for maintenance men equipped with a mixer attachment *(Jiffy)* that can be operated by almost any chucked power tool. Blends in 30-sec. with nary a splash. **(318)**

It's a cinch to keep a hot soldering iron within easy reach, with no danger of fire or burns, if you've provided a cool holder. This one *(LaGrange)* is perforated for self-ventilation, fits irons up to ¾-in. dia. **(319)**

Folding-stacking boxes for storing and shipping *(Palmer-Shile)* save space like anything. Four boxes folded take up no more room than one box full of materials. No tools needed either to set up or to fold. **(320)**

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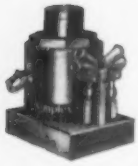
81 hydraulic models to choose from!

THE WORLD'S MOST COMPLETE LINE

SIMPLEX

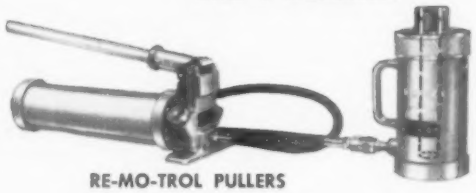
HYDRAULIC JACKS and PULLERS



STANDARD HYDRAULIC JACKS
11 Models
1½ to 100 tons capacity
5¼" to 22" travel

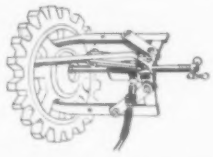
"JENNY" CENTER-HOLE HYDRAULIC PULLERS
6 Models
30 to 100 tons capacity
3¼" to 10" travel

ROL-TOE FOOT-LIFT HYDRAULIC JACKS
3 Models
10 to 50 tons capacity



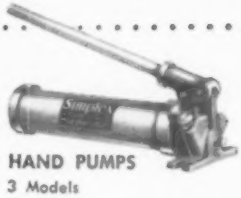
RE-MO-TROL PULLERS
Solid and Center-Hole Rams
39 Models
10 to 300 tons capacity

HYDRAULIC SERVICE and BUMPER JACKS
9 Models
1¼ to 20 tons capacity
13½" to 19" travel



HYDRAULIC PULLERS
4 Models
20 and 30 tons capacity
Push-Pullers, Double and Triple-Grip Pullers

POWERED PUMPS ELECTRIC, GAS OR AIR – 6 Models



HAND PUMPS
3 Models

Look for further information on Lever and Screw Jacks in other advertisements.

TEMPLETON, KENLY & CO.
2517 Gardner Road
Broadview, Illinois

For more facts Circle 510 on Reader Service Card

New RIDGID® No. 141
Geared Threader for 2½", 3", 3½", 4" Pipe and Conduit

One Set of Dies!

JAM-PROOF!

New Cam-Action Workholder!

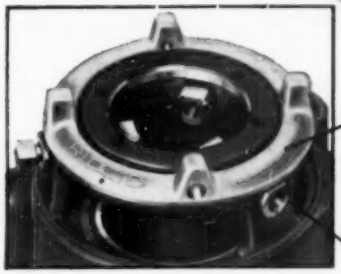
Save Time . . . Cut Costs on all large threading jobs

1. **Only 1 Set of High Speed Dies** threads 2½", 3", 3½" and 4" pipe and conduit. No extra die sets to change or lose! Die size change plate sets quickly and locks at desired size. Easy adjustment for tapered, straight, over or under size threads.

2. **Jam-Proof** for safe power or hand threading. Drive pinion kicks out automatically. Die head **Can't Jam** causing costly repairs and delay.

No. 141

3. **New Fast-Action, Cam-Type Workholder** sets to size by quick turn of collar. Set screw holds work centered for perfect threads every time.



Pat. Appl'd. For.

No. 161

For 4", 4½", 5" and 6" Pipe and Conduit, Buy the New RIDGID No. 161 Geared Threader!

- Only 1 Set of High Speed Dies
- Jam-Proof
- New Fast-Action, Cam-Type Workholder

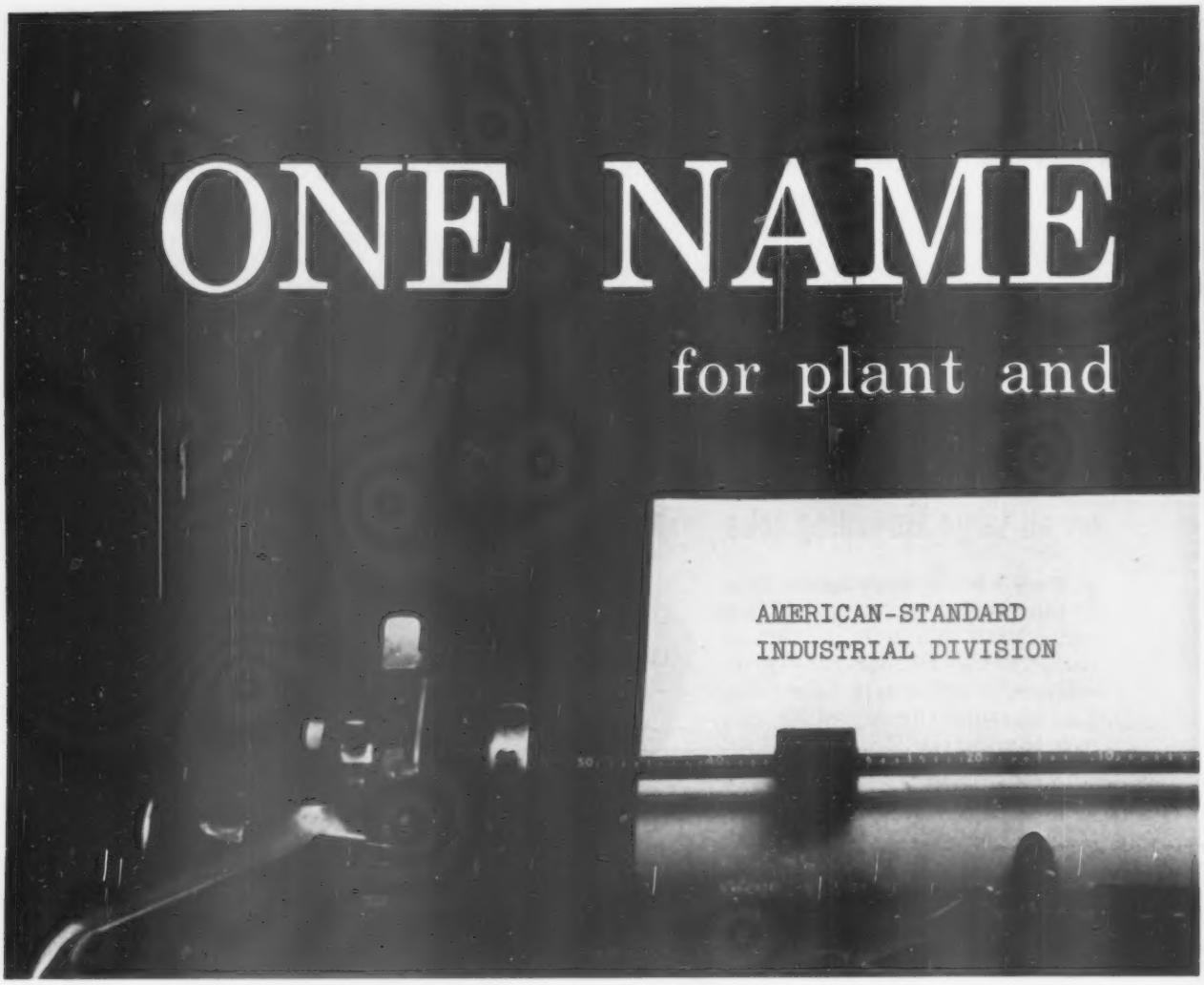
See and buy these work-saving RIDGID Threaders at your Supply House!

RIDGID

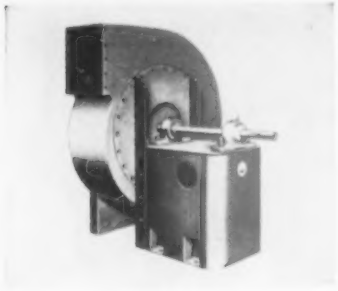
The Ridge Tool Company, Elyria, Ohio, U.S.A.

ONE NAME

for plant and



Industrial fans with wheel types for handling air, gases, materials, shavings.



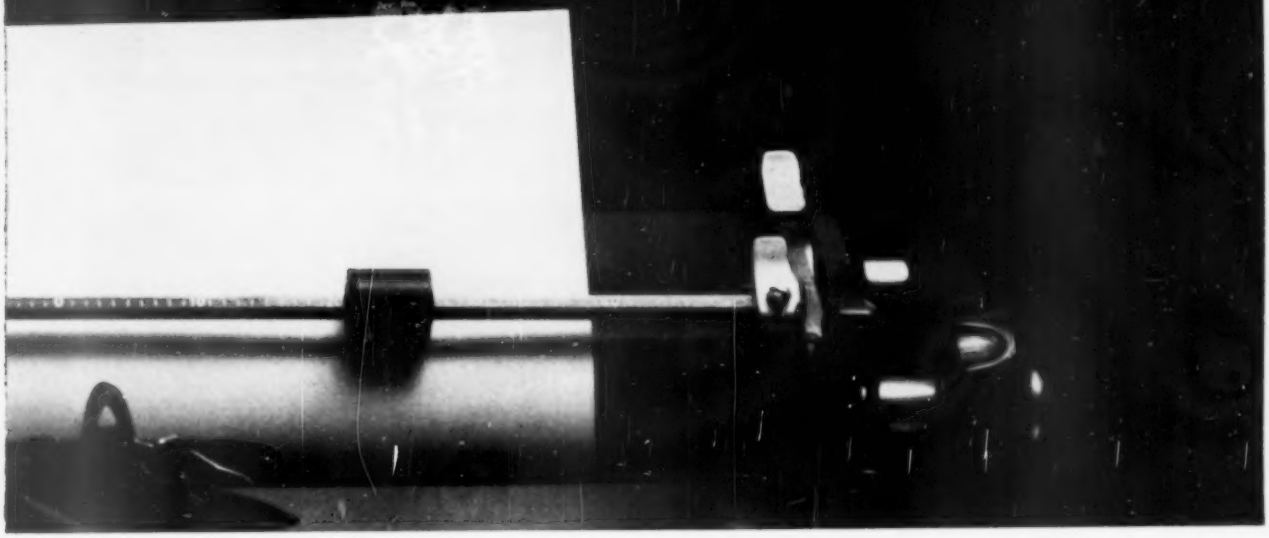
Self-contained ventilating units for supply or exhaust in duct systems.

Ventura® fans for heavy-duty ventilating move smoke, fumes quickly and quietly.

One call for all

AIR-CONDITIONING EQUIPMENT: Refrigerating Machines • Water Chillers • Heating and Cooling Coils • Central-Station Air Conditioners Packaged Air Conditioners • Air Washers • **AIR-HANDLING EQUIPMENT:** Centrifugal, Propeller, and Axial Fans • Power Roof Ventilators Utility Sets • Specialized Fans and Blowers • **HEATING EQUIPMENT:** Firebox, Scotch-Type and Packaged Boilers • Steam, Hot-Water, and Gas-Fired Unit Heaters • Heating and Ventilating Units • Cabinet Heaters • **PROCESS EQUIPMENT:** Dust Collectors • Heat Exchangers Lube Oil and Jacket Water Coolers • *Gyrol*® Fluid Drives • Centrifugal Compressors • Mechanical Draft Fans • Surface Condensers

is all you need to know process air-handling equipment



American-Standard* Industrial Division is the name to know for air-moving equipment to handle *every* duty. For, American-Standard's complete line of precision-built equipment ranges all the way from propeller fans for spot ventilation to giant centrifugal compressors that supply vital high-pressure air in industrial processes.

The point is, American-Standard Industrial Division can supply all the components for an efficient plant and process air-handling system tailored to your needs. You deal with one organization. You get one-source responsibility for quality and performance in equipment designed, engineered, and manufactured to work together.

Get in touch with us. Offices in all principal cities are staffed by product specialists to assist with equipment selection and on-the-job problems. AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICHIGAN. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO.

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For more facts Circle 512 on Reader Service Card

FACTORY CATALOG NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

PRODUCTION

1—Grinding Machine. Bulletin 2-273A-1 (8 pages) describes precision grinder for internal, external, rotary surface work. Emphasizes versatility for small-lot production. Lists standard units, accessories. Photos. *Heald Machine Co.*

2—Gap Presses. Bulletin M-1000 is an illustrated 12-pager that shows mechanical gap presses in 75-, 110-, and 200-ton capacities. Shows two series—one with clutch on back shaft, other with clutch on crank shaft. *The Oliver Corp.*

3—Ultrasonic Cleaning. Guide (12 pages) for potential users is subdivided into chapters on application, solvents, metal cleaning principles. Handy primer for quick reading. *National Ultrasonic Corp.*

4—Barrel Finishing. Controlled tumbling is the subject of 36-pager titled "Carbotrol 7" (Form A-1525). Presents applications, job analyses, compounds, abrasive media, machines, specifications, case histories. *Carborundum Co.*

5—Contour Machines. The heaviest and most rugged of company's stationary table band machines are described in 12-page catalog (Form 59-46). Shows applications in filing, polishing, line grinding, and band sawing. *The DoALL Co.*

ELECTRICAL

6—Basic Switches. Catalog No. 63 (20 pages) discusses four groups of switches—postage stamp size, 2-circuit, sub-subminiature, subminiature. Covers 100 switches, actuators, assemblies. *Micro-Switch.*

7—Load Control Systems. Theory and application of tie-line load, frequency load, reactive power, and power limiting control are given in 4-pager (GET-2916A). Describes strip-chart recorder and control equipment. *General Electric Co.*

8—Safety Switches. This 8-page Bulletin No. 502 describes light, standard, and heavy-duty switches. Information includes dimensions, capacities, voltages, and hp. ratings to help you in your selection. *Frank Adam Electric Co.*

9—Electronic Instruments. Bulletin 571 (16 pages) tells about miniature electric-eye applications for counting, sorting, monitoring, assembling, and automatic weighing in packaging, printing, general production. *Photomation, Inc.*

MATERIAL HANDLING

10—Crane, Hoist Electrification. Trolley busway systems in crane and hoist installations are discussed in 4-page bulletin (No. 76). Covers advantages of these prefabricated, standardized units. Shows service ratings. *Feedrail Corp.*

11—Handling Equipment. This 56-page "idea book" (C-2) features overhead systems of track, cranes, trolley, switches, and the like. Describes heavy- and light-duty systems. Lists hundreds of applications. *American MonoRail Co.*

12—Bulk Material Weighing. Technique of automatic weighing is described, in terms of basic components, in Catalog No. 14 (24 pages). Explains weighing structures, weight transmitters, others. *Weighing & Control Components.*

13—Crane Equipment. Here's a 12-pager that covers electric and hand-operated overhead traveling and jib cranes, hand hoists, I-beam trolleys. Includes information on specially engineered equipment. *Conco Engineering Works.*

14—Wheels, Casters. Catalog DP104 has 40 pages of information on heavy-duty and pneumatic series of casters and wheels. Index is divided into duty classifications, load capacities, descriptions, illustrations. *Rapids-Standard Co., Inc.*

15—Fork Lift Trucks. "Be Years Ahead" is a 16-page review of company's FT series that provides advanced functional design, operator comfort, simplified service. Photos show construction, operating features. *Allis-Chalmers Mfg. Co.*

16—Storage Rack. This 4-pager (211) presents a new plastic wheel live storage rack—with higher rating for carton storage than skate wheel racks. Gives "10 Basic Rules for Order Filling" to aid your order picking. *M-H Standard Corp.*

17—Conveyor Equipment. Catalog No. A101 has 46 pages that describe systems to meet every wheel-conveyor need. Construction and other data on regular and heavy-duty models will help you pick system. *Sage Equipment Co.*

18—Lift Trucks. Performance, maneuverability, economy of operation and other advantages are outlined in 8-page brochure. Trucks are designed for safe handling of loads up to 20 tons. *Hyster Co.*

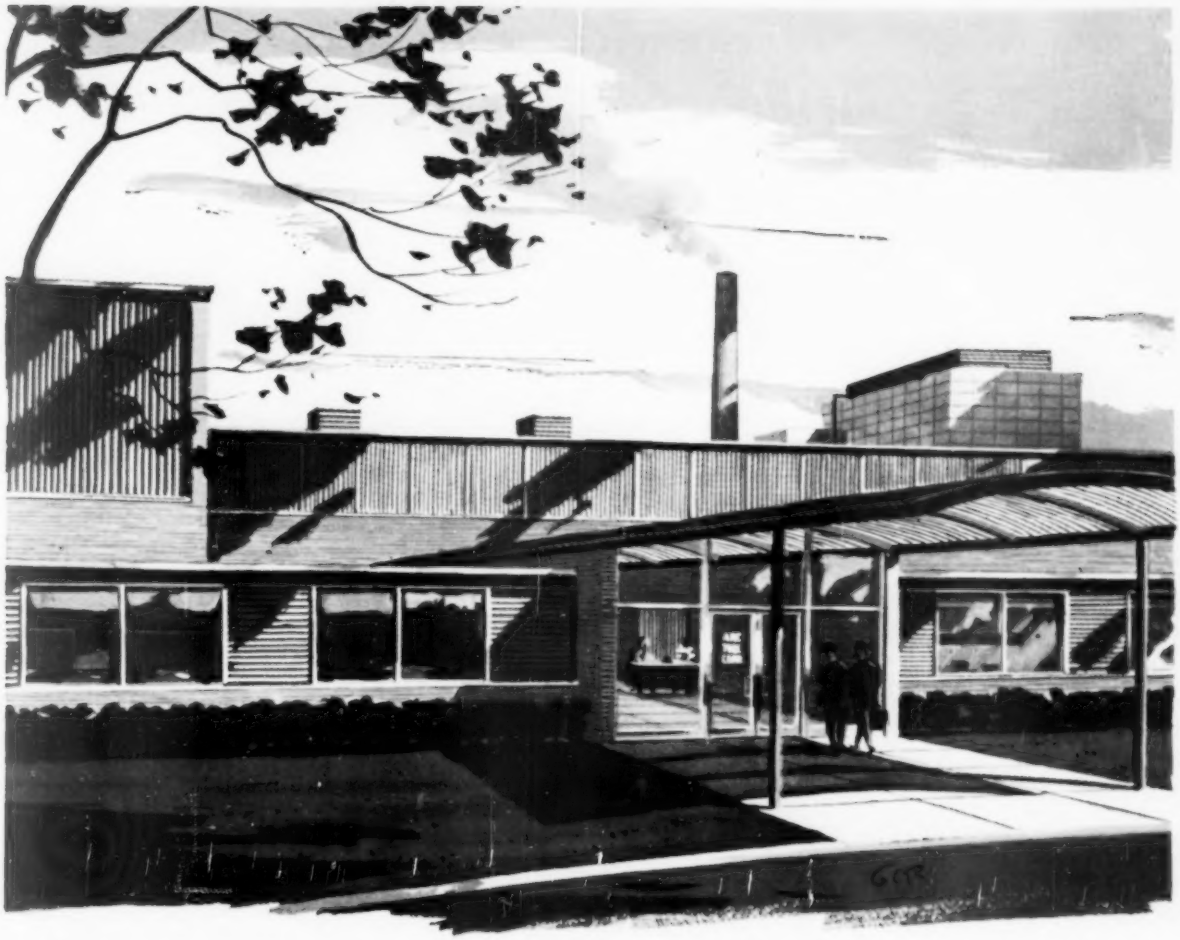
MAINTENANCE

19—Aluminum Fencing. Here's a 12-pager that tells how aluminum chain-link fencing provides permanent and corrosion-resistant enclosures and protective barriers. In various thicknesses. *Kaiser Aluminum & Chemical Sales, Inc.*

20—Oilers, Oil Controls. Circular 580 (4 pages) illustrates and describes bottle oilers, oil cups, and automatic constant level controls. Includes dimensional specifications for glass or bronze cups; also applications. *Lunkenheimer Co.*

21—Hydraulic Rescue Equipment. Catalog 0911-1 has 6 pages on operation of hand-powered hydraulic pump connected by flexible hose to hydraulic ram for rescue work. Another booklet covers packaged sets. *Mine Safety Appliances Co.*

Turn the page



Designed for beauty and maximum low-cost daylighting with Johns-Manville Fiber Glass *Corrulux*®

the translucent building panels that defy breakage

By providing color and functional beauty Johns-Manville Corrulux translucent building panels offer new opportunities in the architectural design of industrial and commercial buildings.

These shatterproof, fiber-glass-reinforced building panels, when used for sidelighting, skylighting, glazing, partitions and awnings, provide translucency for diffused daylighting. Corrulux admits more usable, free daylight, cuts glare, provides evenly lighted, shadowless areas.

When Corrulux goes up, maintenance costs go down. The lightweight panels are made of tough light-stabilized resins reinforced with millions of high-strength glass fibers. Corrulux will not crack, warp, buckle or sag. It resists the effects of most industrial fumes and is impervious to weather. Ordinary rocks, hailstones and flying objects have no effect on Corrulux.

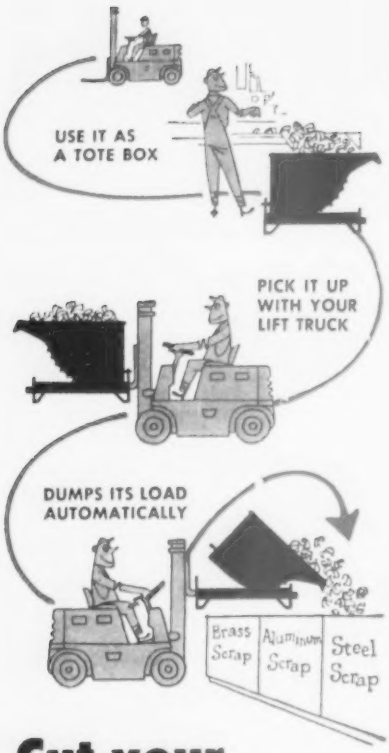
Corrulux panels 4′ to 12′ in length, 26″ to 40″ wide, are easy to handle and install. They require a minimum of framing. No special flashing or caulking is needed.

For additional information on how J-M Corrulux can be utilized in new construction and for modernization of old buildings, see your Johns-Manville distributor. Or write to: Johns-Manville, Box 158, N.Y. 16, N.Y. In Canada, Plastic and Allied Building Products, Ltd., Box 250, Dundas, Ont.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

For more facts Circle 513 on Reader Service Card



Cut your scrap-handling costs 50%

Handling scrap metal is a simple, one-man operation when you use Roura Self-Dumping Hoppers. Place them in strategic spots for scrap collection. One man with a lift truck carries them to scrap bins or freight car . . . flips the latch and the hopper automatically dumps its load, rights itself, locks itself, and it is ready for another load. Hoppers may be labelled for different kinds of scrap for easy, profitable scrap segregation. No wonder they're cutting costs in hundreds of plants.

Forks or platform of any standard lift truck slip easily into under-frame of a Roura Hopper. Pick-up is swift and simple. Hoppers are made in five sizes, ½ to 2 yard capacity, and mounted on live or semi-live skids with choice of wheels.

They're made of $^{1}/_{10}$" steel plate with continuous arc-welded seams. Good for years of toughest service. Standard models shipped from stock immediately. Also available in stainless steel and galvanized. Start now cutting costs with Roura.

ROURA
Self-Dumping
HOPPER

WANT DETAILS?

Clip this coupon . . . attach it to your letterhead . . . sign your name . . . and mail to . . .

ROURA IRON WORKS, INC.
1423 Woodland Ave., Detroit 11, Michigan

For more about these items, circle numbers on Reader Service Card next to back cover.

22—Hydro-Filter. This 6-page bulletin covers wet-type dust collector, gives dimensions and other data for four models. Capacities from 1000 to 40,000 cfm. Explains why hydro-filter is easy to maintain. *National Dust Collector Corp.*

23—Vibration Mounts. Engineering, performance, and other details on these mounts are given in revised 8-pager. Uses principle of "rubber-in-shear" for vibration isolation and acoustics control. Diagrams and tables are included. *Hamilton Kent Mfg. Co.*

24—Safety Equipment. Here's an illustrated 76-page catalog that includes flammable engineering fundamentals. Information includes hazards and control, storing and dispensing, transporting of flammable liquids. *The Protectoseal Co.*

INSTRUMENTS AND CONTROLS

25—Trip Control. Revised Catalog 65b (16 pages) tells how trip control can be applied easily to manually operated stamping machines, air presses, riveters, press brakes, shears, welders. Photos show 15 installations. *Micro Switch.*

26—Ventilator Controls. Automatic control systems for hot water, steam, gas-fired, and electric unit ventilators are described in Application Manual (44 pages). Shows actual control applications covering all makes and models of ventilators. *Barber-Colman Co.*

27—Meters. Two 8-pagers: GEA-6925 is on operation and advantages of meter for measuring flow of fuels, liquids, gases directly in pounds. GEA-6892 covers printing demand meters with up to 999-impulse capacity. Meters are easy to maintain. *General Electric Co.*

28—Instrumentation Service. Here's a 16-pager (No. 107) that tells about company's installation through start-up service for automation and instrumentation systems. Services include construction of panels. *Panellit Service Co.*

29—Control Instrumentation. Bulletin A913 has 8 pages of technical data, photos, and diagrams on electronic control. Large chart shows major system components arranged functionally for choosing proper controls. *Swartwout Co.*

AUXILIARY

30—Pump Motor. Bulletin No. F-1953 describes Holloshaft turbine pump motor for outdoor service. Relationship between form and function is major design feature. Easy-to-read cutaway view of motor. *U. S. Electrical Motors, Inc.*

31—Elbow Fans. Here's a 4-page bulletin (VEF-59) that describes fans for handling clean, contaminated, hot, or explosive air or fumes at normal or elevated temperatures. Photos of fans, sizes, and selection data. *L. J. Wing Mfg. Co.*

32—Air Compressors. Catalog 36A (28 pages) covers models from ¼ through 20 hp. Describes outfits, power plants, simple compressors that meet many requirements. Useful question-and-answer section, selection charts. *Dunham-Bush, Inc.*

MECHANICAL

33—Speed Drives. Bulletin 3600 (6 pages) presents mechanical adjustable drive for woodworking and machine tools, and other applications. Operates on a-c power, has speed ranges from 8:1, ratings from 1 to 30 hp. *The Louis Allis Co.*

34—Speed Reducers. Single reduction worm gear reducers with new high-load-capacity thread form are subject of 32-pager (3805). Four types: D for 2½- to 4-in. centers, bottom and top drives, vertical mounting. Specifications, selection examples. *DeLaval Steam Turbine Co.* *Turn to page 142*

New!

Allen-Bradley Bulletin 700 Type BR Relay with Easily Convertible Contacts

Bulletin 700 Type BR relay with four poles arranged for normally open contact operation.

Changeover made in seconds!

The contacts of the new Type BR relay can be arranged for either normally open or normally closed operation—and any changeover in the field can be made in seconds. A screwdriver is all that's needed.

Sets new standards in mechanical life and contact reliability!

This all-new addition to the A-B line of Bulletin 700 control relays has been designed to keep pace with the developments and progress in modern industry. The Type BR relay particularly satisfies the requirements of modern automatic machines where the control functions must be altered frequently to meet new and changing production requirements.

Quick and easy convertibility of the Type BR contacts from normally open to normally closed contacts —or vice versa—enables "on-the-spot" changes. Such built-in contact flexibility of the Type BR relays can be used to reduce relay inventories.

Exhaustive laboratory and field tests have indicated that the new A-B Bulletin 700 Type BR relays will establish new standards for the mechanical life and contact reliability for this general class of industrial relay.

Another great convenience for the user lies in the fact that a convertible auxiliary contact can be added to either or both sides of the Type BR relay—having full switching capacity—without disturbing the wiring or removing the relay. These auxiliary poles are easily mounted from the front.

Of course, all Type BR relays have double break, silver alloy contacts that never need attention. The cast-plastic coil is impervious to the most severe atmospheric conditions.

Please write for full details on this latest addition to Allen-Bradley's line of *quality* industrial relays, today!

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
Member of NEMA

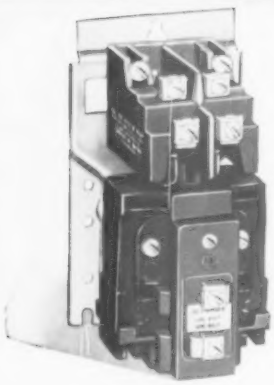
QUALITY MOTOR CONTROL

10-59-MR

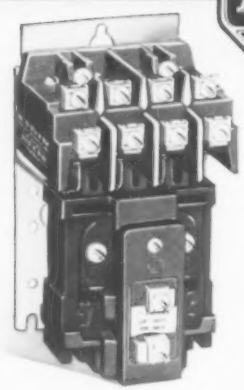
NEW Allen-Bradley Bulletin 700 Type BR RELAYS

are available with from two to eight poles— all with contacts *easily convertible* from N. O. to N. C.

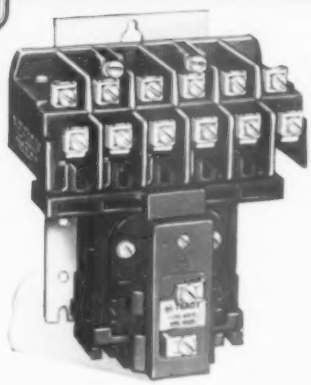
A-B QUALITY



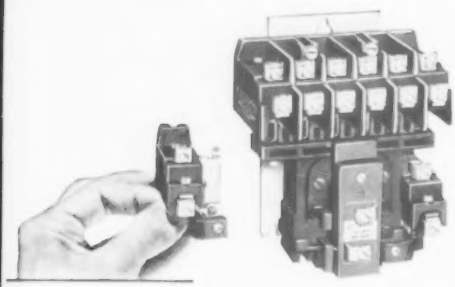
Two Pole Construction



Four Pole Construction



Six Pole Construction

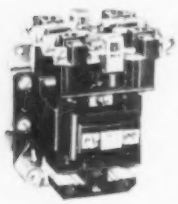


Two extra convertible poles can be easily added—in the field

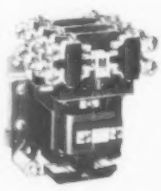
An auxiliary convertible contact pole—having full switching capacity—can be easily added to the left and right sides of the Type BR relays. These auxiliary poles are front-mounted and can be added without disturbing the wiring of the relay—and without removing the relay. All relays are designed to also accept stab connectors, and—all terminals are accessible from the front.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Other popular Allen-Bradley industrial relays



Improved Bulletin 700 Type B
General purpose relay made with up to 8 poles.



Improved Bulletin 700 Type BX
Universal relay with both N.O. and N.C. contacts.

More mechanical life—greater contact reliability

10-59-MR

ALLEN-BRADLEY

Member of NEMA

Quality Motor Control

THERE MUST BE AN EASIER WAY

OLD PURSEWAD HATES TO PART WITH ANYTHING... ESPECIALLY OLD DRAWINGS!!
JUST PUT A LITTLE MORE TAPE ON THESE... AND THEY'LL LAST FOR YEARS!!
I CAN'T DRAW ON THESE THINGS...THEY'RE ALL TAPE NOW!
I'VE HAD MY GLASSES CHANGED 4 TIMES AND I STILL CAN'T READ 'EM
THE ONLY THINGS THAT SHOW UP ON THE BLUEPRINTS ARE TAPEMARKS AND CREASES
IT'S GOOD THE GUYS IN THE SHOP HAVE GOOD MEMORIES
HE SHOULD CALL IN A JUNKMAN...OR ASK A BLUEPRINTER ABOUT AUTOPOSITIVE PAPER INTERMEDIATES

Much easier for you when you have your print room, or local blueprinter, reproduce old drawings on Kodagraph Autopositive Paper. You get positive photographic intermediates *directly*. Dirt and stains are dropped out . . . weak line detail is turned into dense black photographic lines . . . ends the need for costly retracing. And you get the sharpest blueprints or whiteprints around.

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Kodak
TRADE-MARK

"Buffalo" Air Cooled Condensers. Shipped as factory-assembled packages. Capacities from 7½ to 100 tons based on 120° condensing temp. 40° suction, 100° ambient.

NEW

"BUFFALO" UNITS ELIMINATE TROUBLES COMMON TO MOST AIR COOLED CONDENSERS

1. **Minimum Service Requirements** proved in field.
2. **The "Buffalo" "By-Pass Damper Control of Head Pressure"** eliminates many problems inherent in "Balancing Valve Pressure-Regulated Controls". The "Buffalo" design maintains effective head pressure control at reduced load, or with sharp day-night temperature fluctuations. It also prevents over-cooling at low level with low ambient.
3. **Operating Difficulties Reduced to Absolute Minimum.**
4. **Compressor Stays on Line.** Horizontal discharge type units are easily affected by wind, even when deflectors are used. Under certain conditions effective air velocity over coil is so reduced that compressor cannot be kept on line.
5. **The "Buffalo" Control System Requires Considerably Less Refrigerant Charge** than "Flooded Coil Control". Result: Important savings on expensive Freon.
6. **"Buffalo" Units Provide Greater Evaporative Tonnage** (effective air conditioning load) than most other types.

"Buffalo" Air Cooled Condensers offer many other advantages which cannot be covered in this limited space. Your nearby "Buffalo" engineering representative will be glad to give you the full details. Phone him today, or write us direct.

"Buffalo" **BUFFALO FORGE COMPANY**

471 Broadway • Buffalo, N. Y.

Buffalo Pumps Division, Buffalo, N. Y. • Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

INDUSTRIAL EXHAUSTERS • BELTED VENT SETS • PROPELLER FANS • "E" BLOWERS-EXHAUSTERS

For more facts Circle 517 on Reader Service Card

FACTORY / CATALOG NEWS

Begins on page 136

For more about these items, circle item numbers on Reader Service Card next to back cover.

35—Speed Reducers. This 65-page pocket-size catalog supplements company's 186-pager on stock gears and reducers. Has engineering data, dimensions, and application selection charts. *Ohio Gear Co.*

36—Speed Reducers. Booklet 2751, "In-Line Helical Gear Speed Reducers," shows company's expanded line of reducers. Selection data on 20 reducer sizes in double, triple, quadruple reductions. Hp. and torque ratings. *Link-Belt Co.*

BUILDING

37—Diffusing Grille. Catalog F-7757-1 describes new continuous-line grille. Can be mounted in ceiling, floor, sill, or side wall. Easy to install. Includes photographs. *Barber-Colman Co.*

38—Concrete Floor. Easy-to-clean, corrosion- and spark-resistant, non-slip floor surface is subject of 24-page catalog (MP-4d). "Ironclad" floor is said to last six times longer than ordinary concrete floor. *The Master Builders Co.*

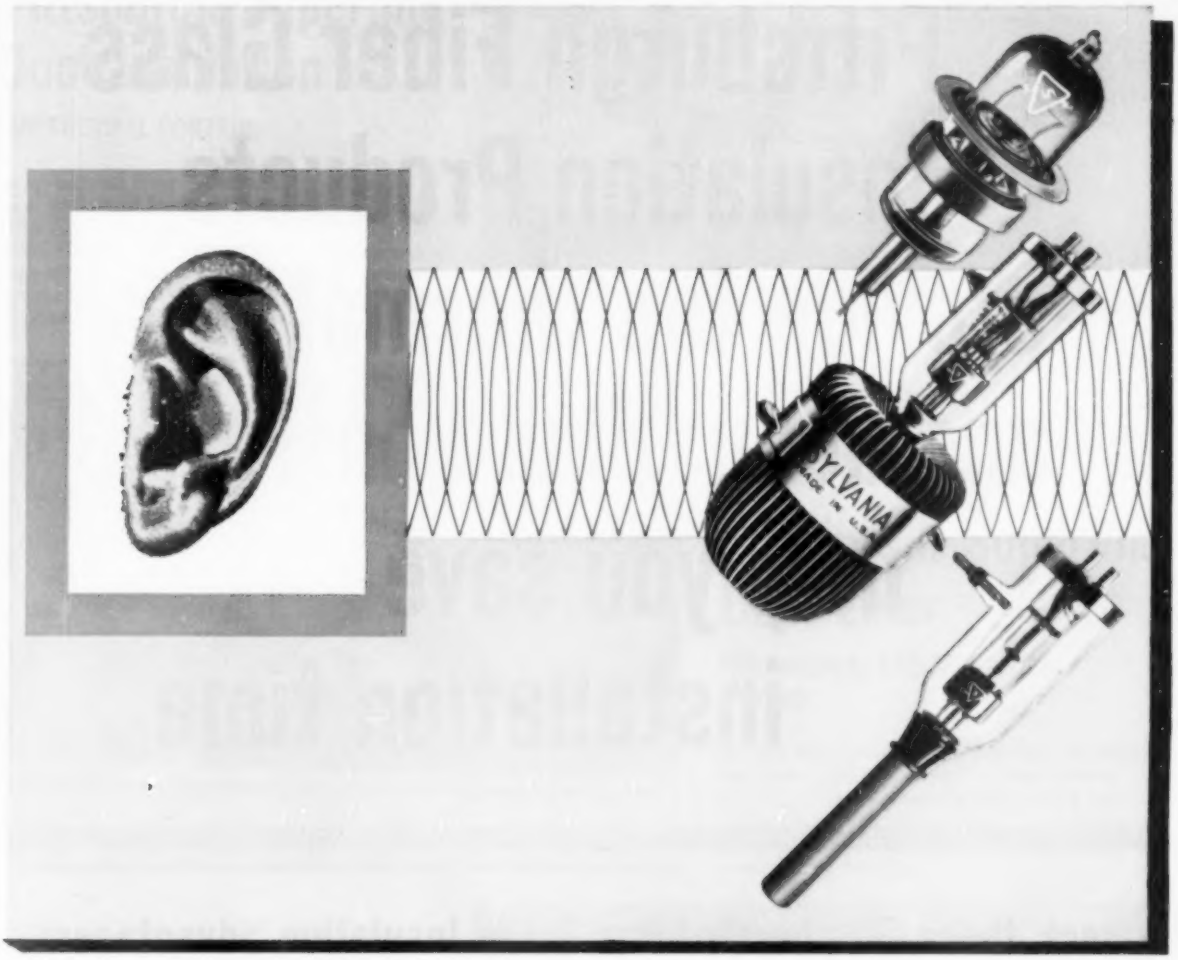
39—Masonry Anchors. This pocket-size "Masonry Anchoring Handbook" (Form 859, revised) has 48 pages of information on anchoring. Tables show proper anchors to use with each fixture. *The Rawlplug Co., Inc.*

VALVES AND FITTINGS

40—Hose and Fittings. Here's a catalog (No. C-3000) with 128 pages on everything you need to know about hose and assemblies, brass and steel tube fittings, hose and tube working tools, racks, etc. *The Weatherhead Co.*

41—Fittings and Flanges. Bulletin 415 (48 pages) illustrates and describes aluminum welding fittings in sizes ½ through 24 in. Includes tables of dimensions and weights. *Flowline Corp.*

SYLVANIA GOLD BRAND TUBES...



and the new standard in COMMUNICATIONS

Sylvania Gold Brand tubes are playing an important role in the continuing progress of communications. They have helped to establish new standards of reliable performance in military, commercial and industrial communications equipment. Now, in keeping with this outstanding record, Sylvania offers a line of transmitting tubes made in the tradition of the famous Gold Brand line.

AM, FM, TV, VHF, UHF—whatever the service, there is a Sylvania transmitting tube to fill the bill. And it will meet your requirements with greater reliability because of Sylvania's Gold Brand background. This means extra quality controls and stringent specification requirements for premium efficiency from every tube. The end result is less down time and more dependable communications.

Here are some of the more popular classes of Sylvania Communication Tubes:

- **High Vacuum Amplifiers**
- **Planar Triodes**
- **Lighthouse Triodes**
- **Modulator Amplifier and Oscillator types —forced air, convection or water cooled**
- **Power Triodes—forced air, convection or water cooled**
- **Transmitting Beam Amplifiers**
- **Pliotrons**
- **Power Tetrodes**

Before your next order for power tubes, check out the Sylvania transmitting tube line. Your Sylvania distributor or salesman will be glad to give you the whole story on the complete line.

SYLVANIA GENERAL SYSTEM

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
In Canada: Sylvania Electric (Canada) Ltd.
P. O. Box 1190, Station "O," Montreal 9

For more facts Circle 518 on Reader Service Card

Look how Pittsburgh Fiber Glass Insulation Products provide top thermal and acoustical control... help you save installation time

Check these Pittsburgh Fiber Glass Insulation advantages:

Lightweight—adds only negligible additional weight to any job.

Easily handled—readily cut with knife, shears or die; flexibility provides fast installation.

Dimensional stability—does not shrink or stretch, assuring long-lasting insulation control.

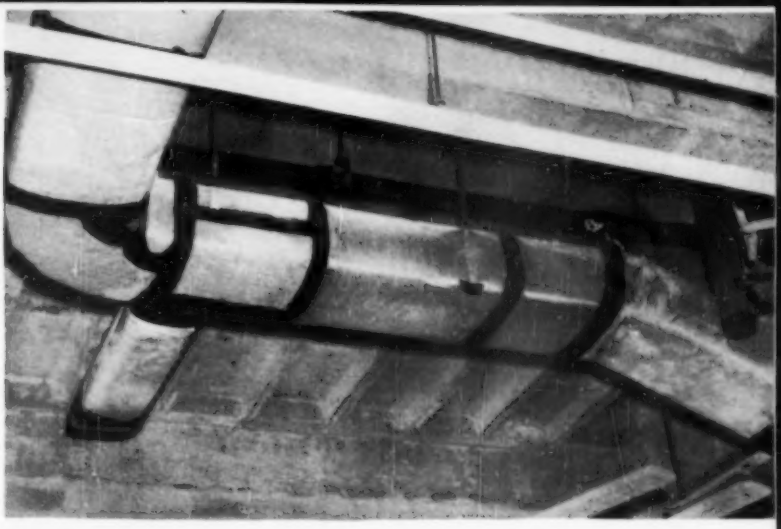
Inorganic—not affected by moisture or heat, will not rot, mildew, oxidize or age; flame resistant, odorless.

Economical—requires less bulk for effective insulation as compared with ordinary insulation; easy application cuts time costs.

FOR ALL-AROUND PERFORMANCE, SPECIFY PITTSBURGH FIBER GLASS INSULATION

In new construction, modernization or routine maintenance, for piping or duct work, insulation products by PPG will give you the quality acoustical or thermal service you're looking for. For more information, call your nearest PPG Sales Office, or write to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pa.*

Sales Offices: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Houston, Jacksonville, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco and Washington



Pittsburgh Superfine Duct Insulation

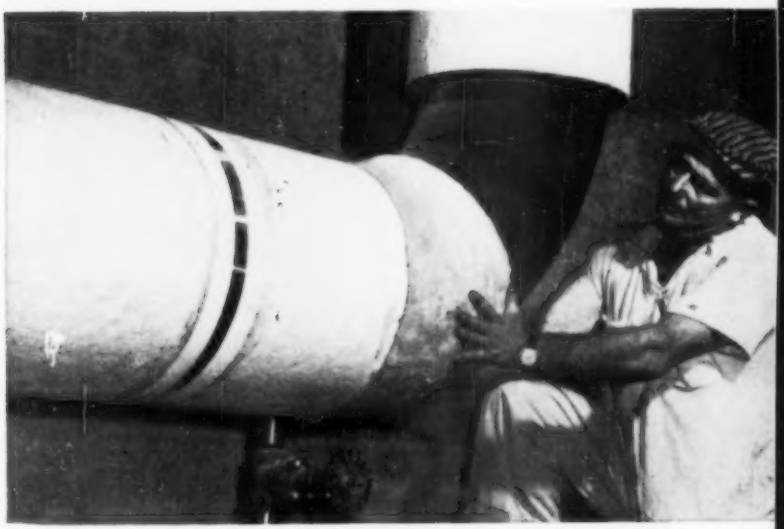
FOR THERMAL CONTROL

wrap-around fiber glass insulation, available in a variety of facings . . . shipped in blanket form . . . lightweight, easily handled . . . clean, non-irritating, odorless . . . good appearance . . . high thermal efficiency . . . flexible, resilient . . . readily fits any desired dimension . . . can be glued, tacked, taped or tied.

Pittsburgh Superfine Duct Liner

FOR THERMAL AND ACOUSTICAL CONTROL

coated with neoprene to prevent air erosion and reduce air resistance . . . low k factor . . . shipped in easy-to-handle lightweight rolls . . . easily cuts to correct size . . . can be glued, tacked or taped . . . can be applied to flat sheet before forming.



Pittsburgh Pipe Insulation

FOR THERMAL CONTROL

molded into a flexible hollow cylinder, slit along its length to provide quick application to pipes or tubing . . . provided in three-foot lengths, with or without jackets, in nominal wall thicknesses ½", ¾", 1" and 1¾" in all standard IPS and CWT sizes . . . has high thermal efficiency . . . low maintenance.

FIBER PPG GLASS PITTSBURGH PLATE GLASS COMPANY

ANOTHER IN A SERIES
OF MOTOR FACTS
FROM ALL INDUSTRIES

Sand... heavy rain... extreme heat...

Nothing stops These Westinghouse Life-Line A Motors

dependably driving oil well pumps in Odessa, Texas district of The Atlantic Refining Company, 24 hours per day, 7 days a week!

"Here's an application," says A. P. Johnston, production engineer at The Atlantic Refining Company, "where we must have continuous motor operation . . . sometimes for as long as 18 months . . . with virtually no maintenance or repair. Many of our pumping stations are remotely located, automatic and unmanned. Any stoppage or motor failure would result in the loss of several hundred barrels of oil. Motor repairs in the field are prohibitive in cost. We must have *complete* motor reliability and that's exactly what we get from our Westinghouse Life-Line® "A" motors."

How about you? Got a really tough motor application which you can't afford to pamper? Then ask your Westinghouse sales engineer to show you how the dependable Life-Line "A" pays for itself through reduced maintenance and repair. Or write to Westinghouse Electric Corp., P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J-22055-R

YOU CAN BE SURE... IF IT'S Westinghouse

On this pumping unit, the 15-hp Life-Line "A" motor operates in an atmosphere of damaging dust, sand and moisture. Despite continuous, heavy-duty service, motor has never suffered any overheating since first installed. Prelubricated bearings of the Life-Line "A" eliminate periodic greasing . . . keep lubricant in . . . dirt out.

For more facts Circle 520 on Reader Service Card

These Maintenance Men
Get the job done fast.
They get it done well.
Reason: informed decisions
by managers who watch
performance trends, and
record them on *These Charts*

Chart Your Way to Better Maintenance

Looking for better maintenance productivity? One way to get it, maintenance experts say, is by better supervision. Give your supervisors the right facts to make intelligent decisions.

What are these right facts? Are they hard to get?

Our people here at Aluminum Company of Canada (Arvida, Que.) have found that four simple trend charts, like those you see on the facing page, telegraph the facts. These charts contain much of the basic information a maintenance manager needs to guide and control the activities of his maintenance manpower. They can serve all levels of supervision—crew foremen, general foremen, and maintenance managers—merely by reporting the facts appropriate to the number of men or crews for which each level of supervision is responsible. And these charts can do all this with minimum paperwork, particularly at the first-line supervisory level.

These are the convictions of our top maintenance management men. They have been using the charts for two years in one department of the mechanical division. E. N. Coulthart, the division's assistant general superintendent, sums up the results this way:

"Our trend charts are easily understood. They provide first-line supervision with a positive indicator of progress—or lack of progress. They point to areas where action is necessary, and give a general idea how each crew is performing. Besides providing impetus to first-line supervisors to strengthen weak spots, they inform higher supervision as to what progress the various crews and foremen are making. Finally they show what results any rearrangement action will bring. In short, they fulfill many of the functions of a management report."

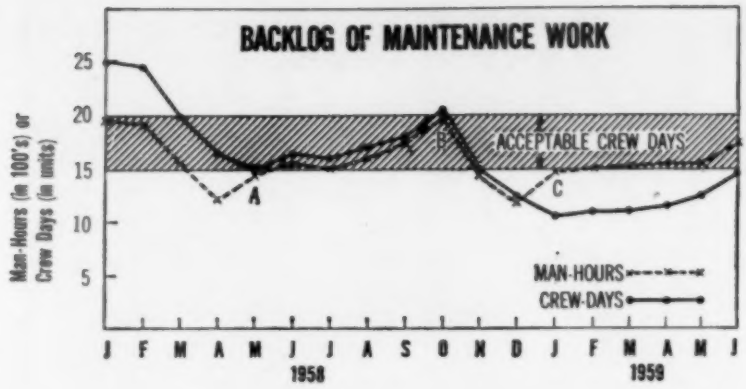
Useful only for big plants? Don't you believe it. Actually the department in which the charts were tested had only 55 maintenance men (plus five first-line foremen and one general foreman who reports to a maintenance supervisor in the office of the mechanical maintenance superintendent). But this chart technique can be extended to larger departments and to any number of them—or it can be limited to a small force of 10 or fewer people.

Monthly report—At Arvida all four charts appear on one letter-size report. They are plotted on graph paper of "10x10 to the cm." cross-section. So they'll all go on one sheet. A copy a month goes to each first-line foreman, general foreman, and supervisor. One master chart is kept on file for each first-line foreman (covering his specific crew). Another master chart is maintained on combined crews for higher supervision. Monthly prints of each updating are made for distribution by the Ozalid method.

The charts depicted in this article are hypothetical. But they do represent actual operating conditions that require supervisory action in manpower control.

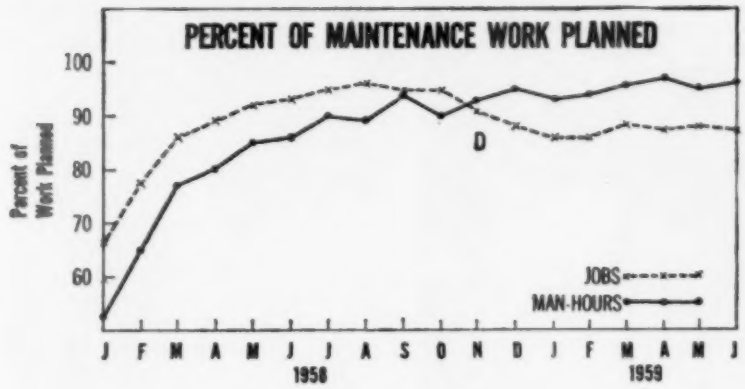
Turn the page

By C. GORDON SAUNDERS
Industrial Engineering Department
Aluminum Company of Canada, Ltd.
Arvida, Que.



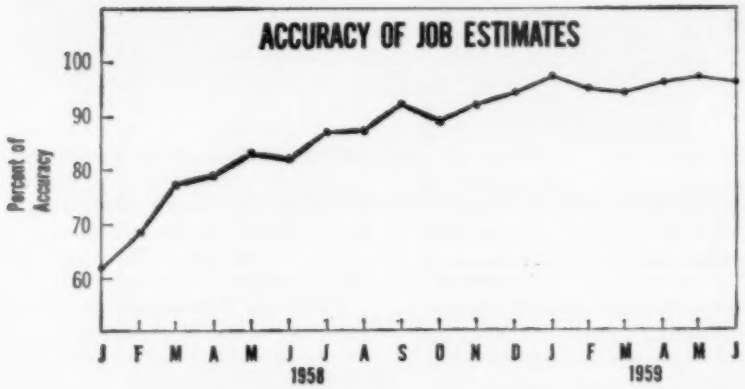
1. Crew work backlog

Purpose: To show estimated man-hours and crew-days ahead. **Example:** Crew of 16 men was cut to 13 to meet seasonal drop in backlog crew-days (A) and to keep within acceptable limits. When crew-days reached upper limit (B), additions were made from central pool. At satisfactory level (C), the crew was cut to 10 men as the backlog was reduced.



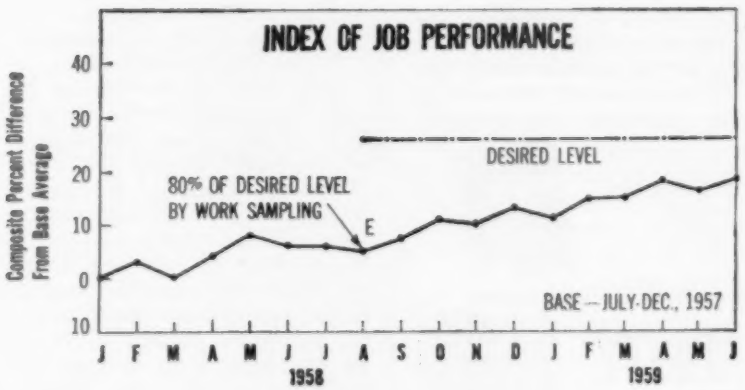
2. % of work planned

Purpose: To show importance and relation of work planning to other key controls. **Example:** Job planning means better man-hour application. Parallel graphs bear this out. Just before the crossing of two lines (D), the foreman decided to emphasize planning of larger jobs to boost percentage of planned man-hours. Rise in man-hours line shows how he succeeded.



3. Job estimate accuracy

Purpose: To help foreman find out how well he is estimating his man-hour requirements on all planned work. The better the estimate, the cleaner the scheduling and the better the man-hour utilization. **Example:** This foreman wasn't doing so well at the start. Estimating accuracy was only 62%. With the help of the chart he boosted his score close to an average of 95%.



4. Performance index

Purpose: To show changes in output by crew. **Example:** When crew reached the first level of improvement, work sampling showed it was still 80% off desired performance (E). Goal line (based on work-sampling results) was added as inspiration. Note effect on Charts 2, 3, and 4. Planning improved estimates, boosted crew performance.

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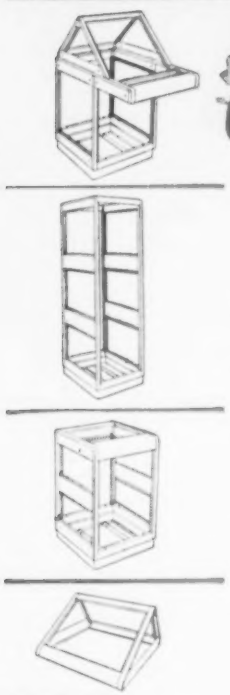

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CHART YOUR MAINTENANCE

Begins on page 148

For the Arvida trial our industrial engineering department has handled all calculations and prepared all reports. A mechanical maintenance control group eventually will do this job. To accumulate the data a clerk has to spend 15 minutes daily with each first-line foreman. Monthly compilation of six reports takes six man-hours.

HOW TO MAKE THE CHARTS

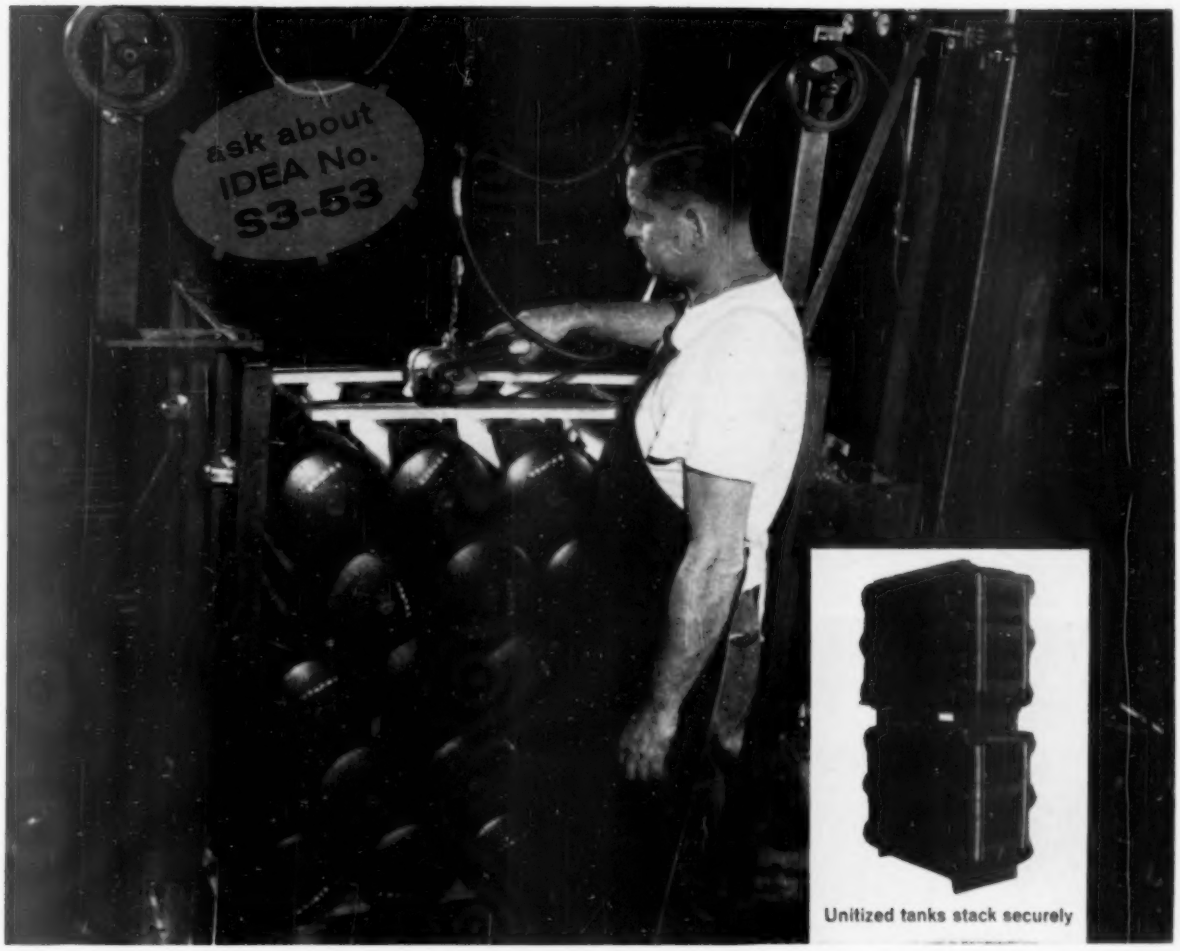
Chart 1. Backlog of Work—To be meaningful, this chart (page 149) must give both man-hours of backlog and crew-days. The second statistic is derived from the first (total man-hours divided by number of men in crew at any given time).

Most maintenance managers know how to figure backlog. At Arvida the backlog is figured from the total man-hour requirements of all active work orders ahead of the crew. It includes routine and repair jobs—those derived from outstanding formal work requests, routine and preventive maintenance schedules, and foremen's estimate of all non-routine work in view.

The range in backlog of 15 to 20 days is based on Arvida's needs in one department. Local operating conditions, type of work, available manpower, production load, and so on, will govern choice of this range. Some plants prefer six to eight weeks or even more. You must decide what's best for you.

Chart 2. Percentage of Work Planned—Again two statistics are needed as management guides: (1) percent of man-hours of work planned, (2) percent of jobs planned. At Arvida planned work is a job that is scheduled and estimated for time, materials, etc.

Calculation of these values for individual crews (also the values in Charts 3 and 4 (page 149) depends on the daily development of a "Planning Control Information (PCI) Sheet" for each crew. On this sheet a daily record is made of total man-hours of work planned and the actual total man-hours worked. At the end of each month, the total man-hours planned is divided by the actual total worked, and multiplied by 100. The resulting



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percentage is then plotted in on Chart 2. Similarly, the number of jobs planned and the number actually completed are recorded daily, totaled monthly, and figured as a percentage. This result also is plotted in on Chart 2.

Values for combined crews are derived monthly from this sheet on a "Planning Control Summary Sheet." This worksheet summarizes the scores of all single crews as developed in the PCI form. From those totals the over-all department performances are calculated.

Chart 3. Accuracy of Job Estimates—To get this statistic, the actual time taken to complete every planned job is compared with the planned time estimate. The variance is recorded, whether the time difference is over or under estimate. (Example: a job planned at 20 hours takes 18 to complete. Variance is 2 hours.) The variance for all jobs is totaled each day on the PCI sheet. At end of the month daily totals are added. Finally, the total man-hours of work planned during the month is divided into the total (plus and minus) variance for the month. Resulting percentage is plotted in on Chart 3.

Chart 4. Index of Job Performance—This is based on the premise that many maintenance jobs are repetitive and take the same number of man-hours each time, provided no changes in conditions occur. Thus any deviation in man-hours can be attributed to either or both of two influences: (1) change in physical productivity; (2) change in work conditions.

This leads to the conclusion that a series of statistics of the average man-hours per job for a representative group of repetitive jobs, for a given period, will reflect in direct proportion any changes in output (or job performance) of a crew.

There are two methods for calculating the index of job performance at Arvida. One is easier, but is considered slightly less accurate.

• *Easy Way*—You can use this if the more accurate way (described later) is not feasible from an economy or time angle. It employs data on all jobs performed in a given period, as accumulated on the

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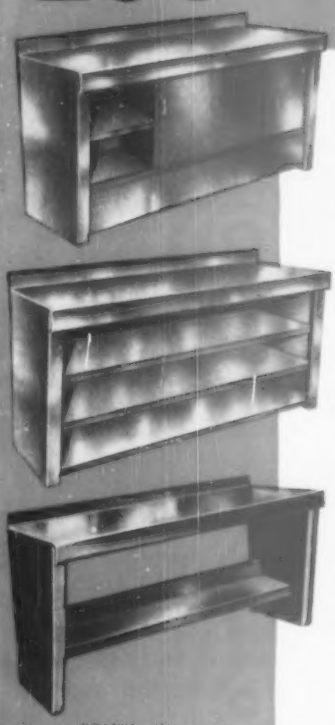

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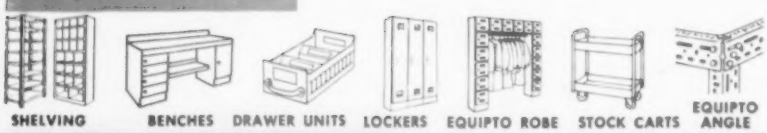

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CHART YOUR MAINTENANCE

Begins on page 148

"Planning Control Information Sheet" or on its plant-wide counterpart, the "Planning Control Summary Sheet." You start with "Average Job Performance." The formula given there is based on total man-hours worked and total number of jobs completed. By dividing the first by the second you get a six-month running average performance for the current month. You then compare this value with a similar value for a base period (developed the same way) to detect the percent difference. Difference is then plotted on Chart 4 (page 149).

For example, assume you get a job performance value of 9.0 man-hours per job for the month. Also assume a job performance value of 10.0 for the base period that you calculated a year ago. The difference of 1.0 man-hour amounts to a 10% improvement and is the percentage to be charted—as a minus value. An increase in value would be shown as a plus value, below the zero line. In this method the vertical values (ordinate) on Chart 4 should be changed to read "Percent Difference From Base Average."

Obviously this method allows inaccuracies in comparisons because of the changing character and length of jobs performed in any one month. The closer each monthly pattern is to preceding ones, however, the more accurate this method will be. Extreme fluctuations are minimized by the six-month running average.

It's also important to review this base line periodically to keep the percent improvement from being misunderstood. Remember, two main factors affect the productivity level: (1) crew physical work output; (2) better methods and equipment. Since their effects are combined into one line on the chart, any undue influence by one or the other would not be self-evident. A big increase in the index might be caused by large gains due to routine methods improvements, with too little improvement in a fair day's work. Thus gains on the chart could deceive foremen and management as to how they were doing. A frequent check will show how each factor is progressing, as well

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(How Eye Protection pays off for another leading U. S. Company)

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*The $235,000 figure is based on the *average* automatic award of $4,700 for each lost eye *for compensation alone* in the several states in which the American Brake Shoe Company operates. Your state may average more or less. Why not find out? Better yet, find out how little it costs to install an American Optical Eye Protection Program which can pay for itself in less than six months! Write American Optical Company, Southbridge, Mass., or call your nearest American Optical Safety Representative.

**Quality protective equipment such as American Optical safety equipment is an indispensable ingredient in saving eyes and dollars . . . and costs no more.

Pouring operation in foundry of American Brake Shoe Company plant at Mahwah, New Jersey. Note safety goggles on foundrymen.

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Begins on page 148

as the absolute changes in each factor. For example: physical work output by work sampling or time study; and methods improvement by revaluation of average job times.

• *More Accurate Way*—The easy method would theoretically be perfect if all jobs were continuously the same. However, where conditions are less than perfect and higher accuracy is desired, there is a second and preferable method. It's based on a selection of jobs representing an entire cross-section. But it takes time to calculate.

Here are Arvida's instructions to its staff for this method:

1. Choose about 30 jobs that repeat at least once within the set time (one month at Arvida).

2. If any such job is performed several times in this period, pick one at random.

3. Choose these jobs to correlate with a cross-section of all repetitive work as to length of job time. For example:

Range (man-hours)	No. of jobs per month	No. of jobs in sample
0.0–1.0	10	2
1.1–2.0	16	3
2.1–4.0	40	8
4.1–8.0	36	7
8.1–16.0	22	4
16.1–24.0	8	2
24.1–32.0	5	1
Total		27

These ranges are hypothetical, but illustrate a typical spread from low to high job-time values in any plant. You have to be guided by your own experience.

4. Develop data on average job times of the 30-odd sample jobs—preferably for six months back—from records, estimates, or time studies. This will give the base line for comparison.

5. Proceed with calculation of current index value as follows:

Job	Standard or average time (man-hours)	Actual time (man-hours)	% Change 100 (b-a) ÷ a
1	a_1	b_1	p_1
2	a_2	b_2	p_2
3	a_3	b_3	p_3
"	"	"	"
to 30	a_{30}	b_{30}	p_{30}
	A man-hrs.	B man-hrs.	P %

Turn to page 160

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Hats off to the profit makers!

Maintenance departments are major profit makers. Here's why:

A 10% reduction in maintenance costs can result in a *4% jump in profits in the average plant*—according to latest Commerce Department figures.

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Managers throughout the U.S. who have installed and evaluated Organized Lubrication programs can testify to the profit gained.

Texaco Lubrication Engineers can offer help and helpful material to start an Organized Lubrication program in your plant. Why don't you look into it? Call our expert—or write for a copy of our book: "Organized Lubrication . . . Major Cost Control Factor."

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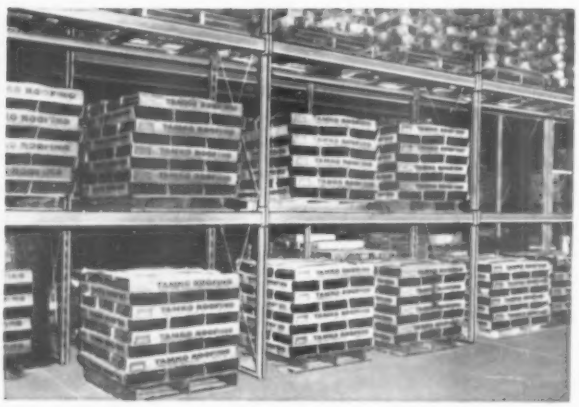

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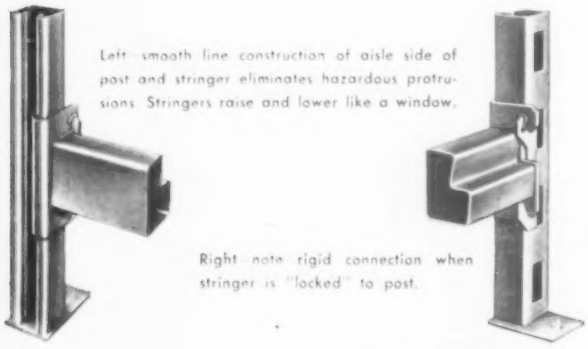

Left—smooth line construction of aisle side of post and stringer eliminates hazardous protrusions. Stringers raise and lower like a window.

Right—note rigid connection when stringer is "locked" to post.

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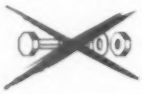

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Hall Industrial Water Report

VOLUME 7 DECEMBER 1959 NUMBER 6

How Will It Come Out?

Industrial water softeners of many types are daily turning out millions of gallons of treated boiler feedwater. Usually the softener effluents are of good quality, meeting chemical specifications and suitable for the intended use. But things can go wrong both mechanically and chemically, and close control is essential to make sure the water "will come out all right."

Hall Laboratories engineers are thoroughly familiar with water softening procedures and equipment. They can serve you not only in setting up, but also in maintaining the routine control necessary to make your equipment operate efficiently. And they can help you determine the cause of trouble when, for no obvious reason, effluent quality is poor.

Coagulant Aid Helps Softening

The hot lime soda—hot zeolite water softener at a western paper mill functioned satisfactorily until demand pushed flow rate up to and beyond the capacity of the unit. Then more sludge was carried out of the sedimentation tank in the lime soda-treated water than the filters could handle. Some went on to the hot zeolite softeners, seriously fouling the ion exchange material. Excessive backwashing was necessary.

Hall engineer L. Arnold considered how he might hasten settling of precipitated sludge in the sedimentation tank. He recommended the use of a Hagan coagulant aid because this represented the quickest and probably most effective move.

Results were impressive. Soon after the aid was added to the lime and soda ash chemical tank the settled water cleared up. The plant operators enthusiastically pointed out that there was less suspended material in the water going to the filters than there had been previously in the effluent coming out of them.

Hardening Condensate

An automobile parts manufacturing plant prepares boiler feedwater in a hot-process softener. There are two sections in the equipment, one for deaeration of condensate and one for heating and lime-soda softening of makeup. The softened water is filtered and combined with the deaerated condensate.

The operators watched water conditions carefully and operated without trouble for some time. Then one day they were puzzled by unprecedented difficulty in maintaining reserve phosphate in the boiler water. Wishing to solve the problem as quickly as possible they called Hall engineer D. W. Whiteside.

When Whiteside arrived at the plant the operators reported to him their observation that the normally clear boiler feedwater was turbid. The turbidity was quickly determined to be sludge from the softening section of the hot process unit. Further checking showed that the sludge was in the deaerated condensate while the treated, filtered makeup water was clear.

Now it was obvious that something was wrong inside the softener, permitting treated water from the softening section to get into the condensate section. Subsequent inspection revealed partial plugging of the downflow pipe through which treated water flowed from the primary softening zone to the settling chamber. Water level rose high enough in the primary softening zone to spill the treated water over the baffle separating this from the condensate section.

A good cleaning of the downflow pipe corrected the trouble. Routine cleaning during regularly scheduled shutdowns was established to avoid future difficulty.

Care of Ion Exchange Resins

Exchange resins are expensive. A running check on performance is important in setting up cleaning and replacement programs which assure maximum useful life and put replacement cost on a uniform annual basis thus avoiding sudden major replacement expenditures.

Plant operators should carefully watch the relationship between raw water composition and gallons of water treated between regenerations of cation exchangers. A noticeable drop in capacity can give early warning of the need for cleaning.

Gradual increase in pressure drop across a cation bed is an indication that the material is becoming dirty or is starting to break down. This information should be used in conjunction with service capacity data to check condition of the resin.

Crosslinkage checks are desirable about once per year for small cation units and twice per year for large units. If caught in time, breakdown can sometimes be retarded by treatment of the water with sodium sulfite or sulfur dioxide.

The condition of anion exchange material is best watched by observing the amount of dissolved solids removed per cubic foot of resin per cycle.

Rinse requirement is important too. Increase often means deterioration or fouling. The observations may be used alone or together to determine the need for cleaning or replacement.

Hall engineers can help you set up and maintain routine testing and regeneration programs as well as the longer term checks on performance. Furthermore, Hall Laboratories is well equipped and staffed to do special work on resin capacity, crosslinkage and experimental cleaning.

Water is your industry's most important raw material. Use it wisely.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information on how the Hall System can help you solve your particular water problems, write, wire or call address below.

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RADIO CORPORATION OF AMERICA

Electron Tube Division Harrison, N. J.

CHART YOUR MAINTENANCE

Begins on page 148

These calculations will give you:

- Percentage change of the difference between job-time totals: 100 (B-A) ÷ A = S%.
- Average of total percentage changes of all jobs: P ÷ 30 = T%.
- Composite percentage change: (S + T) ÷ 2 = C%.

[Derivation of C (composite percentage change) merits explanation. Purpose of averaging S and T is to minimize recognized distortions caused by this arbitrary method of calculating the effects of various size jobs on percent change in performance. One distortion: The longer the job, the more a given percent variation increases the value of S. But this influence does not bias the value of T, because T is derived from actual changes.]

6. Enter C% on Chart 4 (page 149) as score for current period.

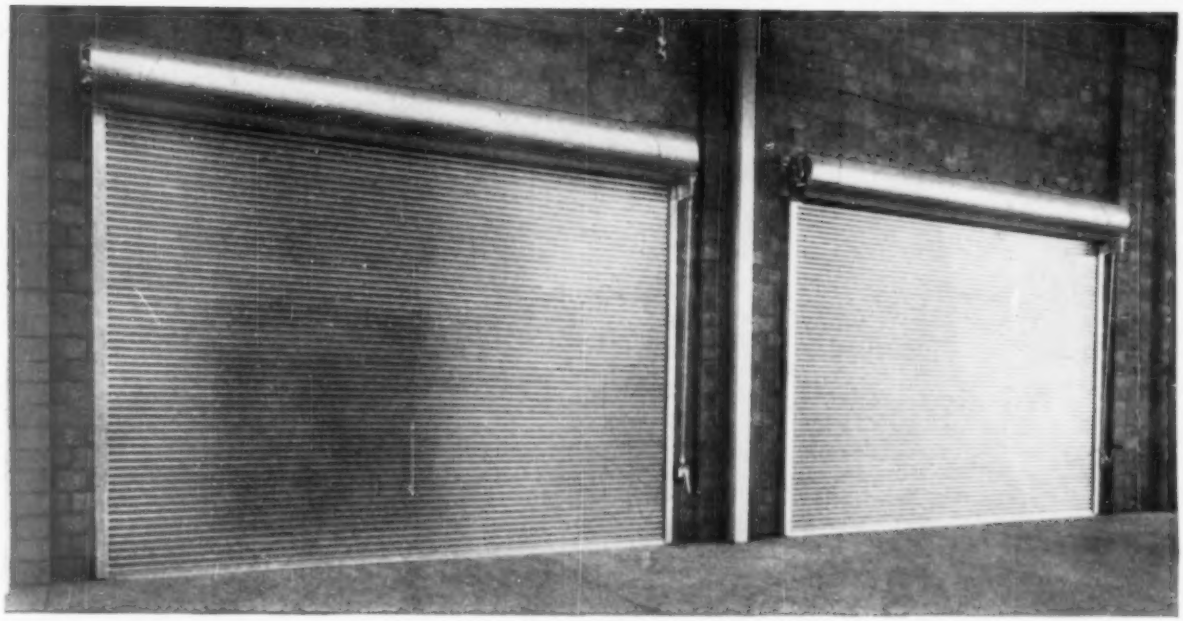
7. Repeat procedure monthly.

As suggested in the explanation of the "easy way," this base line should be updated periodically—say, every two to three years or whenever a major change in methods affects all jobs. This is done by re-evaluating the standard times for the sample jobs to get the latest value of "A Man-Hours" (above).

Another distortion occurs where variation in job time may contain a fixed value for all sizes of jobs, thus distorting the interpretation of T. For example, emergency delivery time of materials from the stockroom is about the same for all jobs, short or long. So repetitive occurrences of such fixed values tend to increase T faster for a short job than a long one. But this influence does not bias the value of S, which is based on actual time changes. Thus, each distortion tends to cancel out the other.

The ideal but impractical way to handle these distorting influences involves complex mathematical computations to balance effects (as in a cost-of-living index). Arvida engineers found that such extra effort gains only a small amount of accuracy, is not worth while. After all, the value of C in the index of job performance is only a guide. Even at that it's a good one. The climbing line of Chart 4 is typical of its results at Arvida. **END**

ROLLING STEEL DOORS



64 Mahon Rolling Steel Doors Add to Efficiency and Security of New Seaway Wharf Facilities at Duluth!

Above are two of the eight Mahon Automatic Rolling Steel Fire Doors installed in the Fire Walls of the Transit Shed and Warehouse in the New Seaway Wharf Facilities at Duluth, Minnesota. Lower illustration is partial view of Transit Shed. Engineers: Pfeifer & Shultz. Gen. Contrs. Johnson-Drake & Piper.

In the new Seaway Wharf Facilities at Duluth, Minnesota, which include a Transit Shed and Warehouse, there are 56 Mahon Standard Rolling Steel Doors 13'-9" x 12'-0", and 8 Automatic Rolling Steel Fire Doors 20'-0" x 14'-0". Due to the oversize requirements of the Automatic Fire Doors, they were constructed in strict accordance with Underwriters' Specifications and an Underwriters' Certificate was issued to the Seaway Port Authority of Duluth in lieu of the regular Underwriters' Label.

The vertical roll-up action of Mahon Rolling Steel Doors requires no usable space either inside or outside the opening—and it eliminates overhead tracks which restrict headroom and interfere with crane handling. Their all-metal construction gives you the permanence of Bonderite-protected galvanized steel . . . maintenance is minimal; and, in steel, you get maximum protection against intrusion and fire.

No other type of door provides all of these important features which are so essential for functional efficiency in busy doorways today. When you are ready to buy any kind of rolling steel door, check specifications carefully . . . you'll find, through comparison, that Mahon Rolling Steel Doors are built better to give you better service over a longer period of time. See Sweet's Files, or write for Mahon Catalogue G-60.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York, Chicago, Los Angeles and San Francisco
Sales Representatives in All Other Principal Cities

Manufacturers of Rolling Steel Doors, Grilles, and Automatic Underwriters' Labeled Rolling Steel Fire Doors and Fire Shutters; Underwriters' Rated Metalclad Fire Walls, Insulated Metal Curtain Walls, Electrified M-Floors, Acoustical and Troffer Forms, Acoustical Metal Ceilings, Steel Roof Decks, and Long Span M-Decks.

ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

MAHON

I'll take "MAGNAMATIC"... it's DOUBLE QUIET!

1. Exhaust noise effectively muffled.

2. Clutch buzz and ratcheting eliminated.

A talking dog would be more of an oddity than one that couldn't hear "Magnamatic" . . . but ever since the announcement in 1954 of the first effectively silenced screwdriver, CP "Magnamatics" have been building an impressive production line reputation for quiet, torque-controlled operation.

Not only does the "Magnamatic" reduce audible noise levels measurably, but it does it without any sacrifice of speed, power or performance.

In addition, "Magnamatic" the pioneer one-shot screwdriver/nut-runner offers these advantages: runs nuts and screws to precise torque, then stops driving – no chance to overdrive; clutch parts don't wear–hence no need for frequent adjustments; inexperienced operators don't burr screw heads, strip threads, shear fasteners, or damage work; perfect adaptability for multiple spindle applications.

* **DOUBLE QUIET** "Magnamatic," with silent exhaust Capacities: #4 screws to 3/8" bolt size. Reversible or non-reversible types available.

Ask for a demonstration on your assembly line!

Prove to yourself the quietness feature of "Magnamatics". A demonstration on your own assembly line will convince you that the decible ratings of these tools are well below the maximum permissible noise level for industrial plants.

* Silencing is also available on a standard line of cushion-clutch screwdrivers and nutrunners.

Chicago Pneumatic Tool Co., Dept. M36
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Dear Sir:

- ☐ I would like a demonstration on my own assembly line
- ☐ Please send me "Magnamatic" Bulletin SP-3126
- ☐ Please send me "Magnamatic Case Histories" Bulletin SP-3165

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PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

By PAUL A. KING, Attorney, Bigelow-Sanford Carpet Company, Inc.; Member, New York Bar

Some Clear Words on Union Leaflets

If your plant hasn't had a "no solicitation" rule, the day the union starts passing out leaflets is a poor time to initiate one.

Wise plant managers, with an eye on what the union is demanding and getting elsewhere, try to keep their employees' minds off organization by volunteering benefits and working conditions approximating those won through unionization. They do this early, not the day after the union knocks at the door. Because if they wait until the union starts a campaign, they're almost sure to wind up in trouble.

A recent case points up another step that ought to be taken 'way ahead of union organization. It's the business of forbidding passing out of pro-union leaflets in your parking lot or elsewhere on plant premises. If you set up a no-solicitation-on-premises rule when the union requests permission to pass out leaflets, the risk of violating the National Labor Relations Act is great. If you set one up a long time before the union reaches your doorstep, your denial of permission stands a better chance of standing up.

The Rockwell Manufacturing Company had its rule for six long years. When the union wanted to pass out leaflets in its parking lot, it said no. Simply invoked the long-standing rule. Here's what it posted in the plant:

To All Employees

A regulation of long standing provides that the personnel department shall be responsible for the posting and approval of all employee communications.

It has been reported that literature has been distributed to the employees on company premises without company approval. Such practices are prohibited by established company rules. Persons who post notices, and distribute literature of any kind on company property will be subject to disciplinary action which may result in discharge.

Your cooperation in helping your company operate an orderly and efficient plant will be appreciated.

An NLRB trial examiner said the employer did the right thing. But the NLRB disagreed. A U. S. court of appeals backed the trial examiner and the company.

A no-solicitation rule of long standing is step one. But it's only part of the story. Long standing or not, your rule might not be upheld if it denies your employees the opportunity of organizing. There's no question about their right to organize. They clearly have the right to communicate with each other about the advantages of joining a union. On the other hand, as an employer, you're entitled to run a tight shop—a plant free of literature on the floor, free of disruptive arguments during working time. The NLRB's job is to work out "an adjustment between the undisputed right of self-organization . . . and the equally undisputed right of employers to maintain discipline in their establishments."

It's your job to second-guess the NLRB. In short, if the employees have virtually no opportunities to distribute literature and membership applications except on your parking lot or in the plant premises, your no-solicitation rule may not hold up.

In the Rockwell case, the employer posted his long-standing no-distribution rule on the bulletin boards because he wanted to avoid fisticuffs and altercations on company property. Strong pro-union and anti-union feelings prevailed among employees. Then came the geography question. What alternate methods of solicitation were available to the workers?

Rockwell's Plant No. 1 was involved here. It was located in an urban area. There were highways on two sides of the plant. It had broad sidewalks. Adjacent to one side of the plant was a large parking lot, owned by Rockwell, which accommodated some 200 automobiles. Across from the plant, off the highway, was a smaller 100-car parking lot. Approximately 80 to 85% of the plant employees used the larger parking lot. About 400 feet from the highway entrance to this lot there was an entrance to the plant. Rockwell's time-clock was located at the plant entrance—off the parking lot.

Employees requested permission to distribute pro-union literature on the larger parking lot at the plant entrance. No, said Rockwell. The court, in upholding Rockwell, said it was satisfied that the no-distribution rule, established some six years before the critical events, was premised on Rockwell's desire to serve production, order, and discipline. While the no-distribution rule had the effect of closing off one channel of communication to Rockwell's employees, by virtue of the location of the plant and the facilities and resources available to the union, the opportunities for effectively reaching the employees with a pro-union message were still great.

Legal Fees Run High

Companies losing employee wage-hour suits can be compelled to pay for the employee's lawyer. In this case, the fee was bigger than the back pay owed the employee.

Confronted with settling a lawsuit out of court, a company usually appraises these angles: chances of defending successfully, probable judgment in dollars if it loses, fees of its lawyers, and the time and effort required for its executives to prepare and present the

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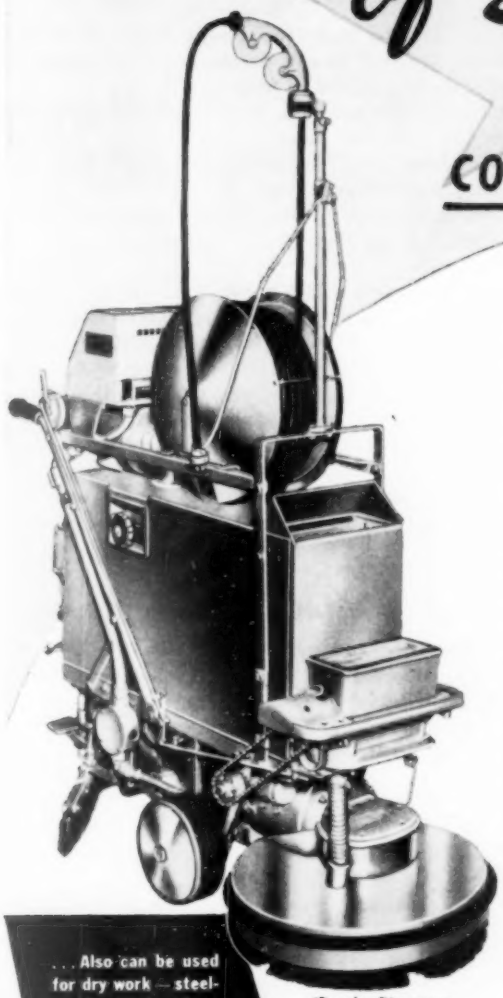
Save 2/3 of Every Hour of Scrubbing Time

WITH A

COMBINATION SCRUBBER-VAC!



...Also can be used for dry work—steel-wooling, et cetera

(Powder Dispenser is an accessory)

Today, even buildings with but 2,000 to 15,000 sq. ft. of floor space can reap the labor-saving, cost-reducing benefits of *combination-machine-scrubbing*. Here's a *Combination Scrubber-Vac, Finnell's 418P* at left, that's specially designed for such buildings. This *electric* unit, with its 18-inch brush spread, cleans floors in *approximately one-third the time* required with a conventional 18-inch machine and separate vac.

The *418P* applies the cleanser, scrubs, and picks up (damp-dries the floor)—*all in one operation!* Maintenance men like the convenience of working with this single unit...the thoroughness with which it cleans...and the features that make the machine simple to operate. It's *self-propelled*, and has a *positive* clutch. There are no switches to set for *fast* or *slow*—slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs quietly. Compactly built, the *418P* also serves advantageously in larger buildings for the care of floors in narrow aisles and congested areas, and is available on lease or purchase plan.

Finnell makes *Scrubber-Vac Machines* for small, vast, and intermediate operations, and in *battery-, gasoline-,* and *propane-powered* as well as *electric* models. From this complete line, you can choose the size and model that's exactly right for *your* job (no need to *over-buy* or *under-buy*). It's also good to know that *a Finnell Floor Specialist and Engineer is nearby* to help train your maintenance operators in the proper use of the machine and to make periodic check-ups. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2512 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

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Originators of Power Scrubbing and Polishing Machines

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WHY IT PAYS TO USE

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the true door — not a curtain,

Door

One of several Rubbair Door installations at the Strathmore Paper Co., West Springfield, Mass.

STRATHMORE

READ THIS ACTUAL CASE HISTORY—

"The installation of Rubbair Doors has really solved three problems for us," said Mr. J. S. Mudgett, Chief Engineer, Strathmore Paper Co., West Springfield, Mass. "The first problem was the necessity for a door that would permit a free flow of heavy fork-lift truck traffic without requiring a stop to mechanically operate a conventional type door. The second problem was considerable heat loss to open warehouse area which was reduced by fast closing action and air seals. The third problem was maintenance costs which have been reduced because of the flexibility of the door. Of course, other benefits have been realized such as safety for workmen as well as a considerable reduction of dust and dirt from the loading platform."

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- Flexible construction
- Safety-cushion nose
- Scuff-resistant wear panels
- Rugged V-seam hinges
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If you have an industrial door maintenance problem, let us help you solve it. Write us the details or send for a free illustrated catalog.

Stic-Klip®

MANUFACTURING CO., INC.
RUBBAIR® DOOR DIVISION
60 Regent Street
Cambridge 40, Massachusetts

Begins on page 164

case. A recent wage-hour suit dramatically pinpoints another cost to be appraised—the fees to be paid to the attorney representing the plaintiff. The law requires the court to award counsel fees to the employee bringing the action. The court in a recent case directed a judgment for the employee of $82.13 as overtime compensation, $82.13 as liquidated damages, and $500 as the fee for the employee's lawyer. He earned it, said the court. (That's one thing the company will never agree with.)

Bonus Is No Gift

This Texas lawsuit made two things clear: (1) Better watch what you say to new employees about bonuses, (2) Better make a record of what you do say.

Employee Allen of Marvin Turner Engineers was hired in 1952. He was fired on Dec. 5, 1957, but was kept on payroll until Dec. 20. Employee Allen received bonuses for each year of employment except 1957. Other employees whose names appeared on the bonus worksheet on Dec. 21, 1957, were paid bonuses —but not Allen.

The company said it had the right to fire Allen. No question about this, the Texas Court said. Agreed that the discharge was not wrongful; but questioned nonpayment of the 1957 bonus. The company argued that when it hired Allen, he was told that the bonus was an incentive paid to the boys who stayed throughout the year. Here the court left the company high and dry, went its own way and ruled that a bonus is not a gift or gratuity but a sum paid for services. Ordered that Allen be paid 11/12ths of the bonus.

Company Welfare Plan Wins

This company held fast when a plant union insisted on its own special health and welfare plan for its employees. The NLRB said okay.

These days there's hardly a union worth its salt that doesn't have a pet health and welfare plan for its members. Trouble is, companies have had their own plans covering employees for many long years. Trouble also is, one plant may deal with more than one union. And if each insists on its own plan for its group, where does this leave the employer?

The Amalgamated Lithographers of America, AFL-CIO, insisted on its own health and welfare plan for a unit that only covered some of the employees in the plant. John S. Swift, the company, bargained on this subject and every other subject brought up. In fact, reached agreement on every subject. But the company held fast when it came to the union's health and welfare plan. It wouldn't have it under any circumstances. Swift failed to bargain in good faith, the union complained. The NLRB didn't think so. Ruled that the parties "bargained on the subject of health and welfare at meetings extending over seven months . . . and there is no evidence that the respondent [the company] en-

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Ultrasonic cleaning—a combination of solvent vapor degreasing and scrubbing action by high frequency sound waves—gets parts cleaner than is possible by any other method. Costs are reduced and production is increased.

The DETREX ECONO-SONIC dimensions are 24" x 14" x 29" high. This size is ideal for precision part cleaning in small to moderate sized plant operations.

With its own filter, still, pump, heater, spray lance and model 600 generator, it is a complete, self-contained cleaning system. There is nothing else to buy and it installs in minutes.

Where hyper-critical specifications exist, Detrex can supply the additional stages necessary to accomplish an in-line cleaning system. Why not write today and let a DETREX representative show you how an ECONO-SONIC unit, or a larger ultrasonic machine, can improve the quality and reduce the expense of your metal cleaning operation.

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- PERM-A-CLOR NA (Trichlorethylene)
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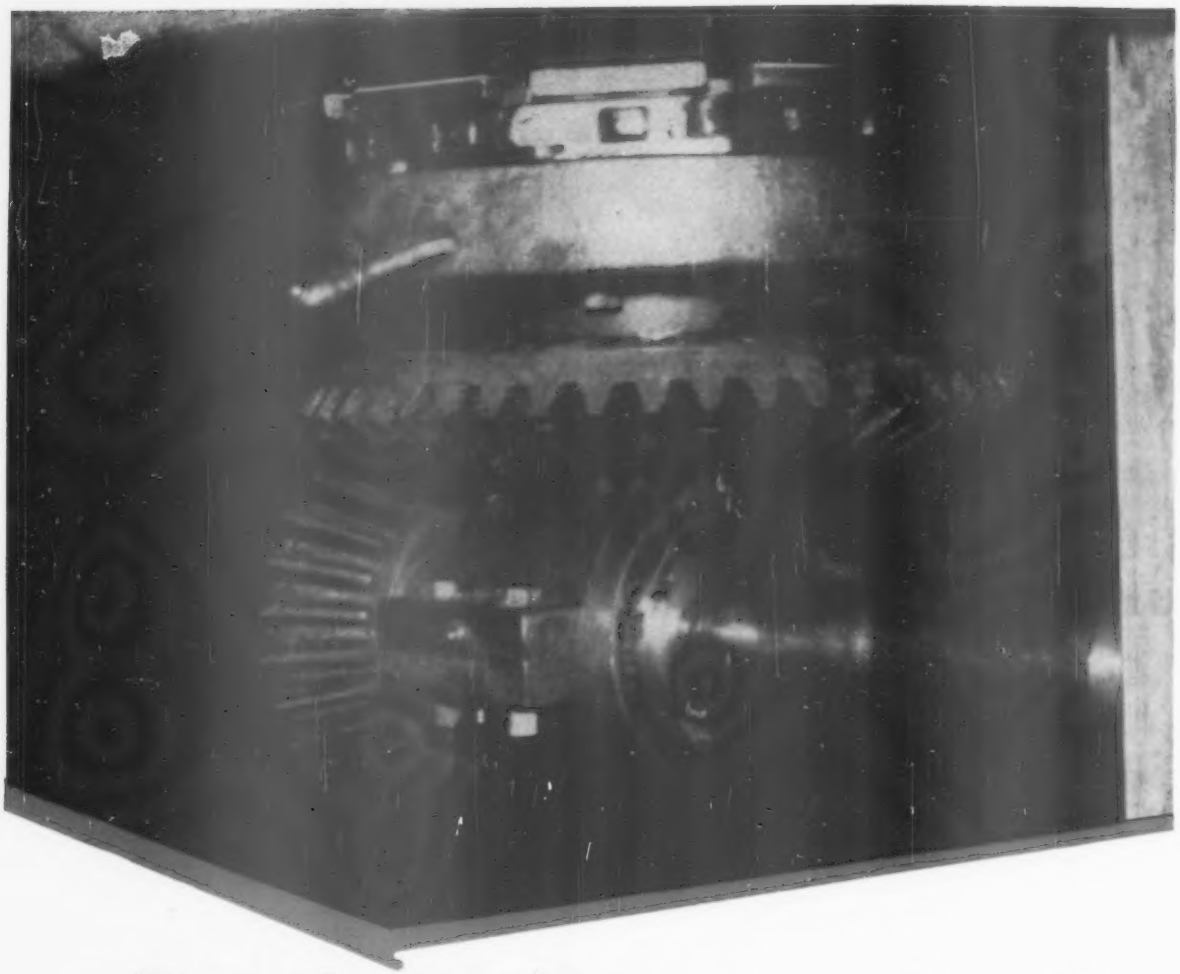

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Over two years ago our engineers converted this main drive gear from a babbitt bearing to a ball bearing unit on a machine at Highland Park Manufacturing Company, Charlotte, North Carolina. Performance of this conversion, according to company engineers, has been outstanding! The housing for the bearings as well as the gear hub was produced by the customer in their own machine shop.

Prior to conversion, machine downtime was excessive because the babbitt had to be repoured every three or four months. A plus saving was in the reduction of power required to operate the machine. Highland Park Manufacturing Company officials now find power consumption is 30% less!

If your older equipment can be modernized with anti-friction bearings — our engineers can show you how. If you need bearings for any purpose, our stock carrying branches can supply you. We are *authorized* distributors of most nationally known makes of bearings. We and the makers guarantee every bearing we supply — Call the branch nearest you now!

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gaged in bad faith bargaining . . ." "Indeed, it appears that, in the course of negotiations the respondent and the union had come to agreement on virtually every major bargaining item excepting health and welfare. Section 8(d) of the statute explicitly states that the obligation to bargain in good faith does not compel either party to agree to a proposal or require the making of a concession."

Propaganda Okayed in Plant

The right to distribute anti-union literature in the plant is one of the last outposts of managerial independence. Take this away and it's sackcloth and ashes for plant managers.

Here's a case where the arbitrator came to management's rescue. Result: Heads can be held high again.

The Gardner-Denver Company had a viewpoint—both political and economic—and thought its employees ought to hear about it. First step was to put up pamphlet racks. Second step was to fill them with its favorite pamphlets, such as: "You can do something about inflation," "How Profits Affect Your Pocket," "What Union Members Write Senator McClellan."

Trouble was, the opinions expressed didn't jibe with the union's views. The union grieved. So the matter was dumped in the lap of Arbitrator Harry Seligson.

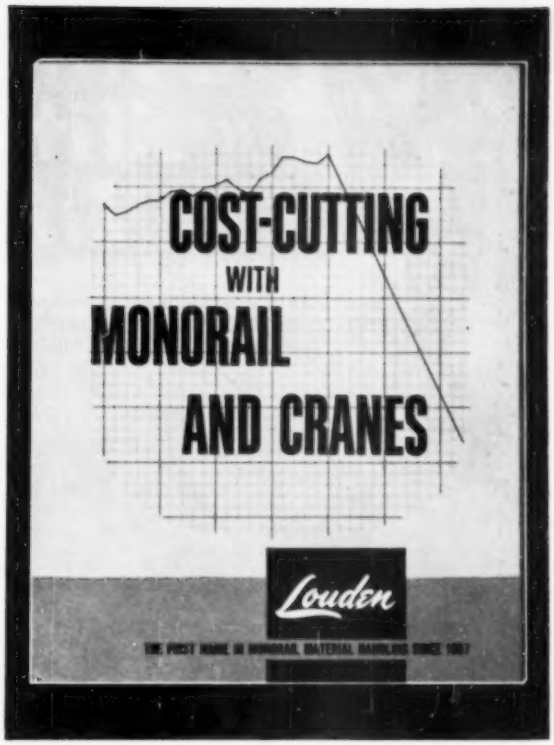
The union's case was based on language in the union contract under "Union Bulletin Boards" which read: "There shall be no distribution of political or advertising matter or other literature upon the employer's premises." This language seemed pretty clear. But there was one wee point the union had overlooked. And the arbitrator jumped on it. Seligson ruled that the clause purported to deal with *union* bulletin boards. To restrict an *employer's* right to distribute pamphlets, there must be express language in a contract. Also, the bargaining history of this particular clause supported management's case.

Yuletide Fiasco

Employees refusing to work on Christmas Day were docked and suspended. The company won the arbitration award.

"Employees who fail to work as scheduled on holidays are ineligible for holiday pay." This can be stated in the union contract in 12-point-type bold face, but still when Christmas comes the employer who dares schedule work on that day may take his plant life in his hands. One December, Bethlehem Steel faced with more orders than it could routinely handle, scheduled work on Christmas Day. But 68 workers said they wouldn't make it. Bethlehem warned the union that it couldn't put up with this sort of thing. Workers who failed to show up would lose their holiday pay and be disciplined to boot.

A total of 350 courageous workers failed to show up and the equally courageous employer docked them as



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SINCE 1867 . . . THE FIRST NAME IN MATERIALS HANDLING

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Don't spoil it- KROIL it!

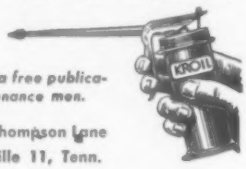
Don't ruin a valuable piece of equipment merely because some part is rusted tight. Apply *KROIL*, the amazing new chemical lubricant that creeps into millionth inch spaces (proved by laboratory tests), **dissolves rust, supplies necessary lubrication and . . .**

Loosens Frozen Parts

18,000 of America's leading plants can't be wrong. They have used KROIL for ten years and depend on it to save expensive labor and valuable parts. They say: "Kroil loosened bushings after a 12-ton press had failed" . . . "on repairing heat treat trolleys formerly destroyed every nut. Now Kroil saves them all, and time, too."

You too can get these results. Try KROIL on money-back basis.

Gallon, $4.00, with Kroiler squirt gun, $4.95, f. o. b. factory.



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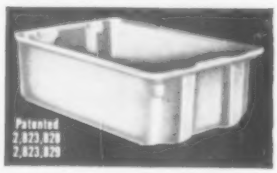
Lewis Containers WILL save your money



The LEWIS Stack-n-Nest® is the container you can best afford to buy. No other unit will give you more for your dollar . . . through superior design . . . rugged construction . . . and versatile, efficient handling. Every container is handled thousands of times in its lifetime. Based on only 2000 handlings, if Stack-n-Nest Pans can save 10 seconds each time, it amounts to better than 5½ man hours. Translated into dollars and cents, the saving is greater than the initial cost of the average size pan.

Write for complete information.

G. B. Lewis COMPANY
1212 MONTGOMERY STREET • WATERTOWN, WIS.

For more facts Circle 540 on Reader Service Card

Begins on page 164

promised and booted them with one-day suspensions for good measure.

The union reminded the employer that Christmas was an important religious holiday. The employer reminded the union that there was a contract clause permitting holiday work. The union retaliated that the suspension plus holiday-pay docking was a double penalty and not in the cards.

The arbitrator who was called in to settle the dispute upheld the employer all the way. To begin with, the employees should have worked on Christmas Day. Thus, under the contract they were not entitled to pay for that day. Secondly, their refusal to work after being warned smacked of insubordination. The arbitrator ruled that the suspension was justified.

Standards for Election Ballots

Sample ballots in a coming NLRB-held election may be circulated to workers. But they must be unaltered.

The NLRB is fussy about sending out ballots before an election. You can do so, but they must be accurate reproductions, they must be marked sample ballots, and they must be unaltered. So fussy is the Board that it yielded to an employer's request to set aside an election when the union sent out a perfect reproduction that met all requirements—except that it pinned IAM buttons to the "yes" square. This was an indication of voting intent. The regional director's argument that no employee had been, in fact, misled by the buttons made no impression on the Board.

No Layoff for Best Men

When there's a layoff you can retain desirable employees despite their lack of seniority if you have the right kind of clause.

Seniority is no respecter of skills. With the union, length of service determines who is to go (when there is a layoff) and who is to stay. With the employer, ability and value to the company is the important factor.

Ability was very important to the Surface Construction Corporation. So a clause was inserted in the contract with Local Lodge No. 1136, District 52, of the International Association of Machinists giving management the right to retain "exceptional" employees who were members of the union. Exceptional employees were defined as employees whose work—in the judgment of management—is of exceptional value. However, the number of exceptional employees was not to exceed 5% of the employees included in the bargaining unit. The union had the right to grieve any abuse of this privilege.

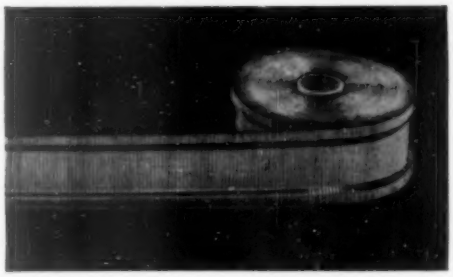
One day the company wanted to demote to union ranks—and retain—two supervisors as welders. An arbitrator upheld this proposal. To begin with, under the contract supervisors could be demoted to the union. Secondly, once demoted, they would qualify for the exceptional employees treatment.

We call this the Bostitch GOLDEN BELT

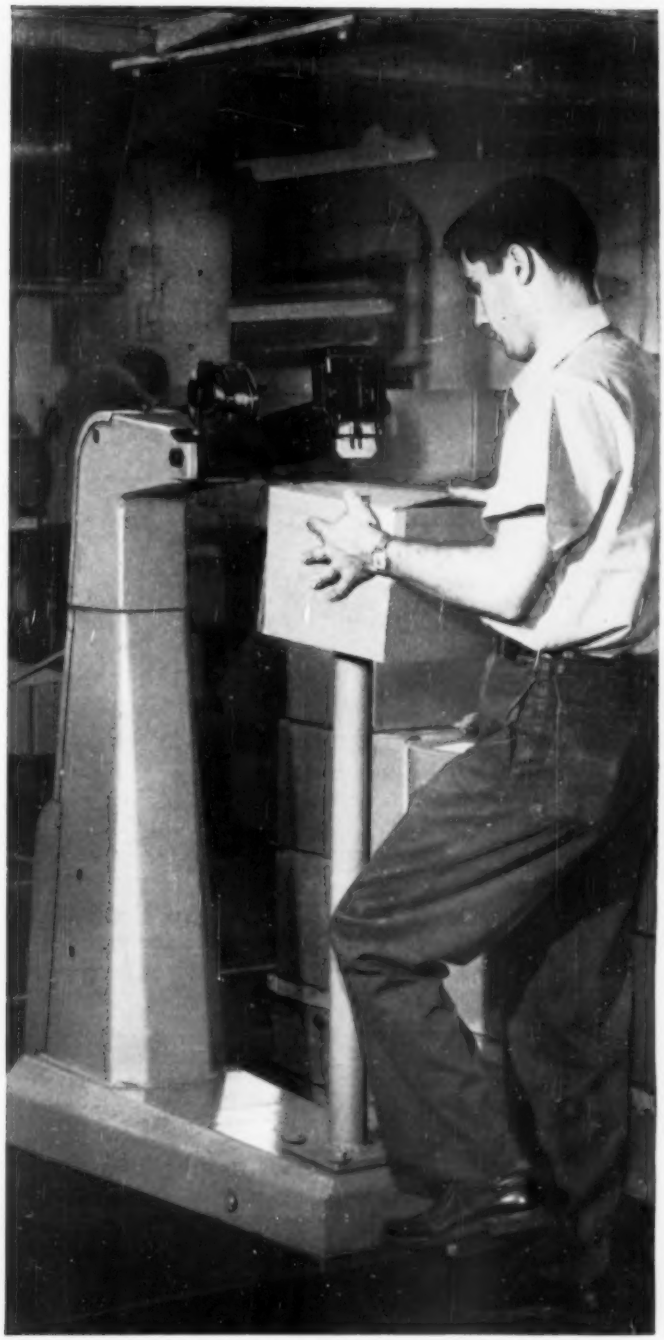
You'll call it the fastest, lowest-cost box bottoming stapler you've ever seen!

The Bostitch Golden Belt Box Bottomer is a revolutionary new concept. The belt on top consists of 4000 cohered and partially formed copper-finished, wide-crown staples. This permits bottoming 1000 boxes without reloading. Four wide-crown staples completely bottom a container which would require 12 to 16 staples of smaller size. You can staple the entire length of the seam in one straight pass through the machine without reversing the box, thus cutting stapling time in half.

Your Bostitch Economy Man—one of 350 who work out of 123 U.S. and Canadian cities—has cost and speed facts on the kind of cartons you bottom. Call him—or drop a line to Bostitch, 612 Briggs Drive, East Greenwich, Rhode Island.



Golden Belt staples have 1¼" crown width, leg lengths of ½", ⅝" or ¾", and meet maximum spacing requirements of Rule 41.



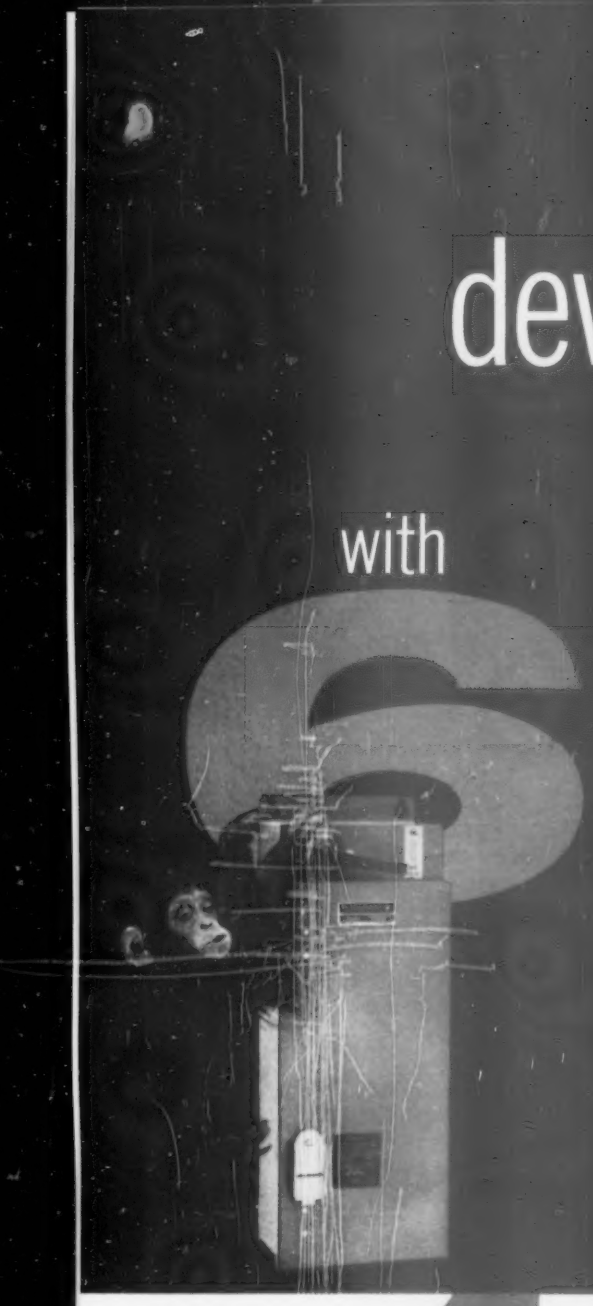
Fasten it better and faster with

BOSTITCH®
STAPLERS AND STAPLES

For more facts Circle 541 on Reader Service Card

Circle 542 on Reader Service Card for items on pages 172, 173➤

Westinghouse develops new motor starters with 6 "monkey proof" safety features



Westinghouse NEMA 12 Life-Line® combination starters end unauthorized tampering, offer greater safety and convenience to service personnel

To order simply contact your local Westinghouse representative or distributor now, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

YOU CAN BE SURE... IF IT'S **Westinghouse**

Watch "Westinghouse Lucille Ball-Desi Arnaz Shows" CBS TV Fridays

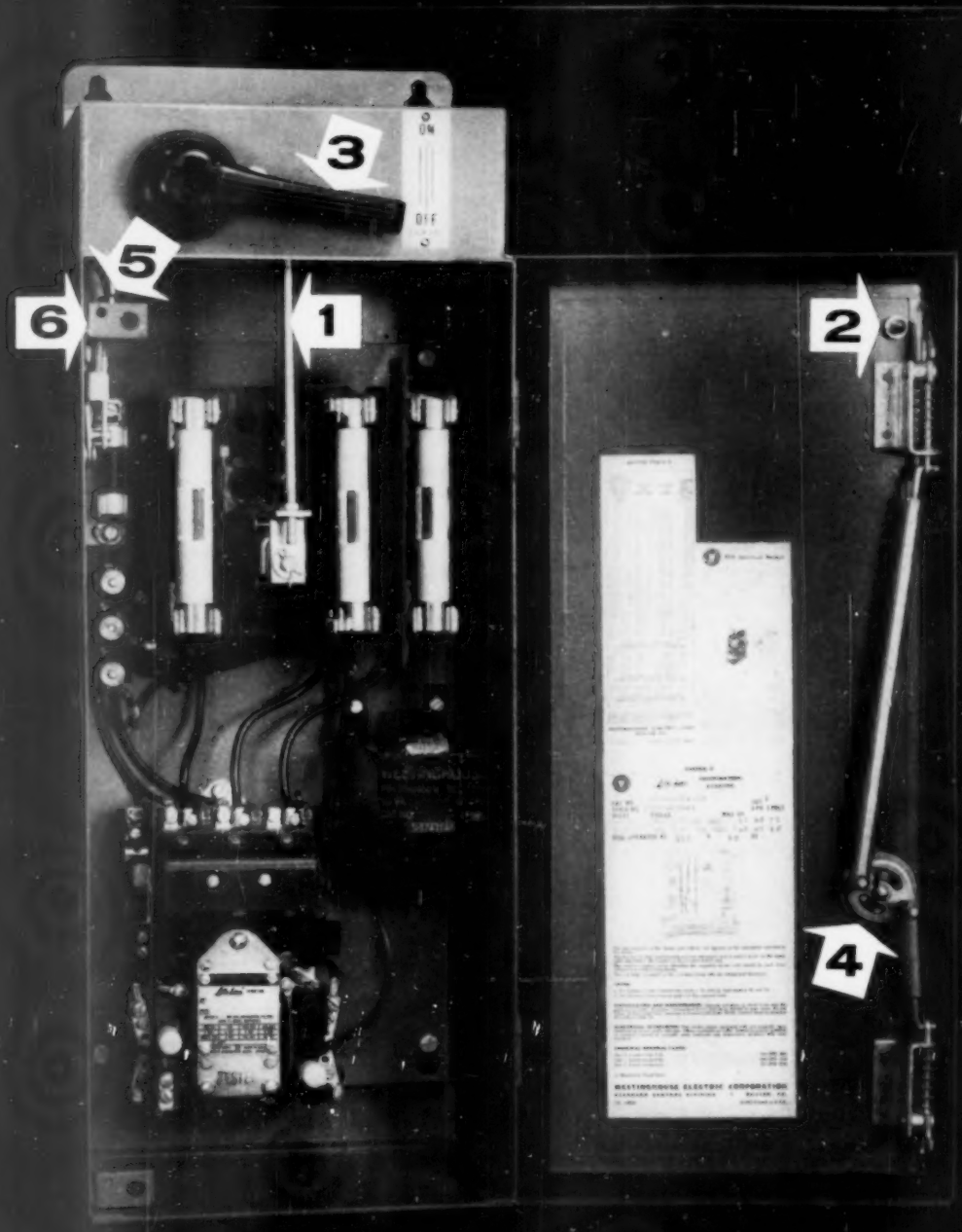
1 2 3

Check these 6 great new safety "firsts"...

SAFE—You always know whether power is on or off because ON-OFF handle is permanently attached to disconnect... even when door is open.

SAFE—Positive gasket seal keeps out oil and dust. An interlock requires that door must be tightly sealed before handle can be moved to ON position.

SAFE—Even when you're out of sight, padlocking ON-OFF handle prevents any operation of disconnect regardless of whether door is *OPEN* or *CLOSED*.



4 5 6

SAFE—Discourages tampering by unauthorized personnel. Tool required to open door.

SAFE—Accidental operation of disconnect impossible when door is open. Disconnect interlock must be deliberately voided to operate ON-OFF handle.

SAFE—Interlock prevents door from being opened when switch is on. ON-OFF handle must be in OFF position to open door.

J-30306

UNION CARBIDE...

protects its operators in process areas with BLONDER-TONGUE CLOSED CIRCUIT TV

Institute, West Va.—The Union Carbide Chemicals plant here uses a Blonder-Tongue "Observer" two-camera installation to enable the control room operator to watch other operators in hazardous process areas.

The operators take samples of materials from pumps and tanks within the structure. Both "Observer" cameras, one at ground level, and one at a 60 foot elevation, are installed in special vapor-proof housings.

This use of closed circuit TV, which extends man's visual range to cover hazardous areas of operation, is just one of many of its applications. Throughout industry . . . in steel mills, pulp mills, power plants, food plants and nearly every expanding industry . . . alert management is constantly finding new uses for closed circuit TV in cutting costs and increasing efficiency and safety. Blonder-Tongue installations are serving this purpose at such companies as the following: DuPont; General Motors; Youngstown Sheet; Johnson & Johnson; Goodyear; Southwestern Portland Cement Company; Albert Einstein Medical Center; Public Service of New Jersey; Industrial Forge and Steel; Sharon Steel; Burns Brick Co.; Brunswick Pulp and Paper Company; Douglas Aircraft; and many others.

Blonder-Tongue and its nationwide staff of specialists offer you a free survey to demonstrate where and how industrial television will benefit you, what an installation involves, and its cost. You can't afford to miss this opportunity to find out (at no risk, no obligation) what industrial TV can do for you. Wire, phone or write today for a free survey.

BLONDER-TONGUE LABORATORIES, INC.

9 Alling St., Newark 2, New Jersey

hi-fi components • UHF converters • master TV systems • industrial TV cameras • FM/AM radios

In Canada: Telequipment Manufacturing Co. Ltd., London, Ont.

Export: Morhan Export Corp., N. Y. 13, N. Y.

A completely automatic Blonder-Tongue industrial TV system (compact, rugged camera; automatic light compensator; TV monitor) providing quality pictures can be installed for less than $2,500.

FACTORY FILMS

Fire Protection Through Research points out the importance of up-to-date information on causes, control, and extinguishing of fire. Both typical and unusually hazardous fires are set and four extinguishing methods—water spray, foam, carbon dioxide, and dry chemical—are demonstrated. 16mm, sound, color, 35 min. For loan, write:

Grinnell Co., Providence 1, R. I.

A Talk With Mr. D depicts the important but often misunderstood role of industrial distribution in the business economy of today. Film uses the Mike Wallace-type interview technique to show how the industrial distributor serves both buyer and supplier. 16mm, sound, color, 20 min. Write to:

Standard Pressed Steel Co., Jenkintown, Pa.

Showcase for Freedom describes how a free economy serves its people with consumer products, industrial machinery, nuclear energy. Film tours 1958 fairs held in Turkey, Italy, Poland, Tunisia, Austria, Yugoslavia. 16mm, sound, color, 13½ min. For loan, write:

Public Information, Office of International Trade Fairs, Dept. of Commerce, Washington 25, D. C.

Design for Power demonstrates advantages of axial piston pumps in high-pressure hydraulics. Shows their use on heavy-duty press equipment, mobile machinery, ground support, and marine power systems at pressures up to and above 5000 psi. 16mm, sound, color, 18 min. Write to:

Denison Engineering Div., American Brake Shoe Co., 1160 Dublin Rd., Columbus 16.

Blueprint for Power dramatizes need for long-term planning of wiring installations to meet today's and tomorrow's increasing use of electricity. Shows how rigid conduit and electrical metallic tubing are made and used. 16mm, sound, color, 20 min. For loan, write:

Rigid Steel Conduit & Electrical Metallic Tubing Section, National Electrical Mfrs. Assn., 155 East 44th St., New York 17.

For more facts Circle 543 on Reader Service Card

For more facts Circle 544 on Reader Service Card ➤

FOR EVERY APPLICATION, THERE'S ONE CRANE OUTSTANDING...

IN PIPE MILLS: One of many P&H overhead cranes installed throughout the mill area, this P&H double-hook crane provides cat-quick but kitten-gentle handling of long and awkward loads of pipe. The twin-lift arrangement is typical of the complete attention P&H engineers give to custom-building cranes to your exact requirements. This means maximum crane efficiency with minimum operating costs because *your* crane is tailored for *your* job.

If you'd like more reasons why satisfied customers have made P&H the largest manufacturer of overhead cranes in the world, write for your free, information-packed copy of Bulletin C-42 to Dept. 111, Harnischfeger Corp., Milwaukee 46, Wisconsin.

P&H

HARNISCHFEGER

...quality and service for 75 years

75

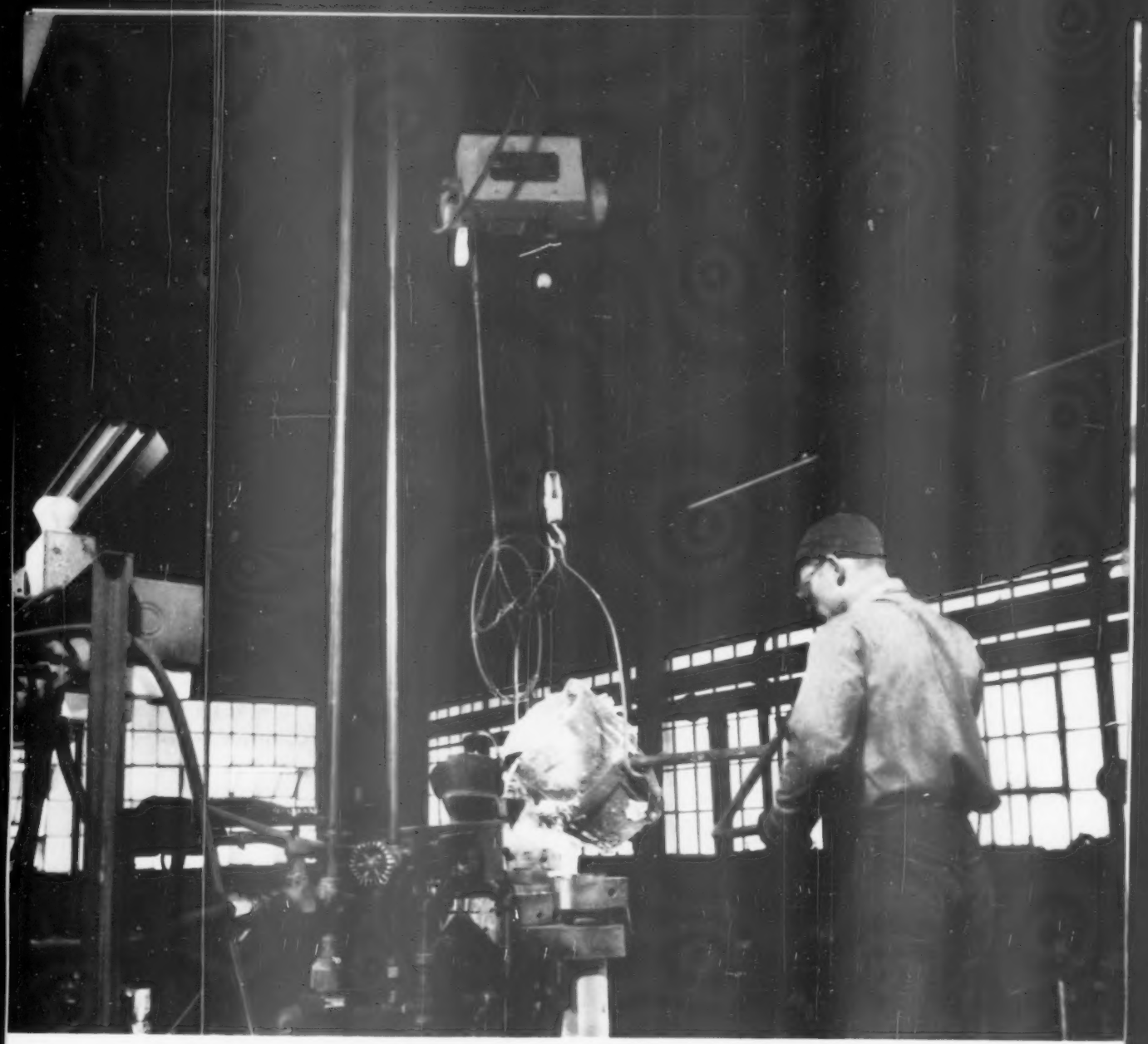


Photo Courtesy Quality Aluminum Castings Company — Waukesha, Wis.

POURING "HOTS" TAKES P&H PRECISION HOISTING

Putting ladles of molten aluminum "on the spot" for careful pouring is a P&H Zip-Lift's full-time job in this foundry . . . a job it handles with a mother's care. From furnace to mold this husky hoist answers every command with a sureness that pinpoints the Zip-Lift's close-spotting ability.

P&H Zip-Lift is "safety-built" too — made to include the positive safety features needed to protect workers from harm. One-hand, fingertip control provides instant response without drift — even under capacity loads. Control current is stepped down to a low 24 volts to protect operator against electrical shock. A double-safe dual brake system stops loads immediately . . . and either brake holds the whole load even if power fails. Limit switches guard against hoist abuse . . . cut maintenance.

Pleasantly enough, Zip-Lift accuracy and safety are priced for the shrewd buyer — starting as low as $200.

If precision safety and price are your buying yardsticks, you'll want a Harnischfeger Zip-Lift. It's fully explained in Bulletin H-20, yours for free from Dept. 203, Harnischfeger Corp., Milwaukee 46, Wisconsin.

P&H HARNISCHFEGER
...quality and service for 75 years

Actual X-ray photo of SKIL Model 75 Heavy-duty ¼ inch drill.

LET'S FACE IT... THE MOTOR MAKES THE DRILL

This is not to minimize the importance of bearings, gears, chuck, switch and housing.

But the fact remains... the motor makes the drill.

And the compact, ¼-inch Skil Model 75 drill has the motor to drill holes in all kinds of materials . . . and drill 'em faster.

Here's proof: In a controlled laboratory test, with 350 pounds pressure applied vertically, a Model 75 pierced ¼-inch steel in 1.26 seconds. Comparable drills stalled out with only 250 pounds of load.

Yet with all its power the Model 75 is more compact, weighs less than most comparable ¼-inch drills. Comes in 7 models with speeds to match any material requirement exactly.

Ask your Skil distributor for a demonstration. Or mail coupon.

PS: Low cost standard duty Model 138 Skil ¼" drill also available for lighter duty work.

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☐ Please send name of nearest distributor.

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For more facts Circle 545 on Reader Service Card

Tuition Supplements—

One Good Way To Help Our Colleges And Universities

The business community has made an impressive start in going to the desperately needed financial aid of our colleges and universities. Business contributions to higher education have increased from only $40 million in 1950 to $136 million in 1958.

This rise in financial aid to higher education should be a great source of satisfaction to the business community. But it goes only part way toward meeting the growing needs of colleges and universities for financial help. Over the next ten years business aid to our privately supported colleges and universities alone must increase to at least $500 million a year merely to provide decent faculty salaries and meet the increased operating costs of taking care of enrollments that will almost double.

One pervasive reason why many business firms have not joined the ranks of the companies contributing to higher education seems to be that, in the interest of prestige and public relations, they are making their provision of aid contingent upon finding some particularly novel way of providing it. So long as this point of view persists, business aid will lag, for there are simply not enough ways of providing financial aid that are both notably novel and sensible.*

How The Plan Works

There are, however, some well-tested ways of providing aid which improve rather than fade in appeal with more using. One such way is the making of supplemental tuition payments to colleges and universities at which a company's employees take courses.

Many companies have scholarship or tuition-refund programs which cover all or part of the costs to their *employees* of taking college courses. But, in most colleges and universities, tuition charges fall far short of covering the full cost of the education given. By making an unrestricted "cost-of-education" grant a part of their employee scholarship or tuition-refund plans, these companies could make a material contribution toward covering the *college's* full costs as well.

The tuition supplement can be a fixed amount or a percentage of the tuition charged. Some plans provide for supplements as high as 100% of tuition, though there is usually an upper limit to the total supplemental payment given for each employee enrolled in the institution.

The plan seems to have originated with the Ford Motor Company Fund. When we at McGraw-Hill first learned of it, it appealed to us as having so many advantages, and so few disadvantages, that we adopted it as one part of our own program of financial aid.

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*The efforts of the McGraw-Hill Publishing Company to find a suitable method of aiding higher education prompted the writing of a "more or less Socratic dialog" entitled *A Business Wrestling with the Problem of Aid to Colleges and Universities*. Copies of this pamphlet, which underlines the difficulty of finding both a novel and satisfactory method of providing aid, are available on request.

HOW THE HEADS OF SOME OF THE INSTITUTIONS TO WHICH McGRAW-HILL HAS MADE GRANTS FEEL ABOUT THE TUITION SUPPLEMENT PLAN

"We are pleased not only because this addition to the never adequate supply of non-earmarked funds is a most welcome one, but also because it attests to the fact that the employees of our neighboring business firms are benefiting from the courses we offer at times convenient for them. We hope this mutually beneficial plan may continue and grow with the years."

Grayson Kirk, President
Columbia University

"I shall take this occasion to express deep sentiments of appreciation, in my own name and in the name of the members of the Board of Trustees, for the very effective manner in which your corporation is aiding higher education by the payments made under your tuition supplement plan. Certainly your action is indicative of the fact that you realize industry and higher education must join forces to preserve the basic American system of free enterprise."

Very Reverend John A. Flynn, C.M.
President, St. John's University

"The growing recognition by business and industry of the financial needs and important services rendered to the community by the colleges and universities is most encouraging, and Temple University is deeply appreciative of the fine support extended through McGraw-Hill's program of supplementary grants."

Robert L. Johnson, President
Temple University

The Plan's Advantages

The main advantages of the tuition supplement plan are:

- **It is simple and easily administered.** Payments can be made when scholarships or tuition refunds are granted, or at another time convenient to the company.
- **It relieves the company of the difficult and sometimes disagreeable task of choosing one college rather than another.** The individual employee makes the choice.
- **It directly serves the interest of the company by encouraging and aiding the institutions where its employees take courses.** In a sense, the company makes contributions in direct proportion to the value it receives in education for its employees.
- **It directly serves the interest of the colleges and universities receiving the grants by getting money to them in the form most appreciated**—unrestricted funds to be used at the discretion of their administrators.

Largely because tuition supplements are unrestricted as to use, this plan enjoys the unqualified approval and gratitude of the schools receiving such aid. This is not true of some of the other plans for granting aid to colleges and universities.

Tuition supplements, of course, can't be regarded as large efforts relative to the need of higher education and the responsibilities of business. But they are a very practical and useful first step, involving almost no problems. If you are not familiar with the idea of supplemental grants, why not discuss it with some of your friends in the field of higher education?

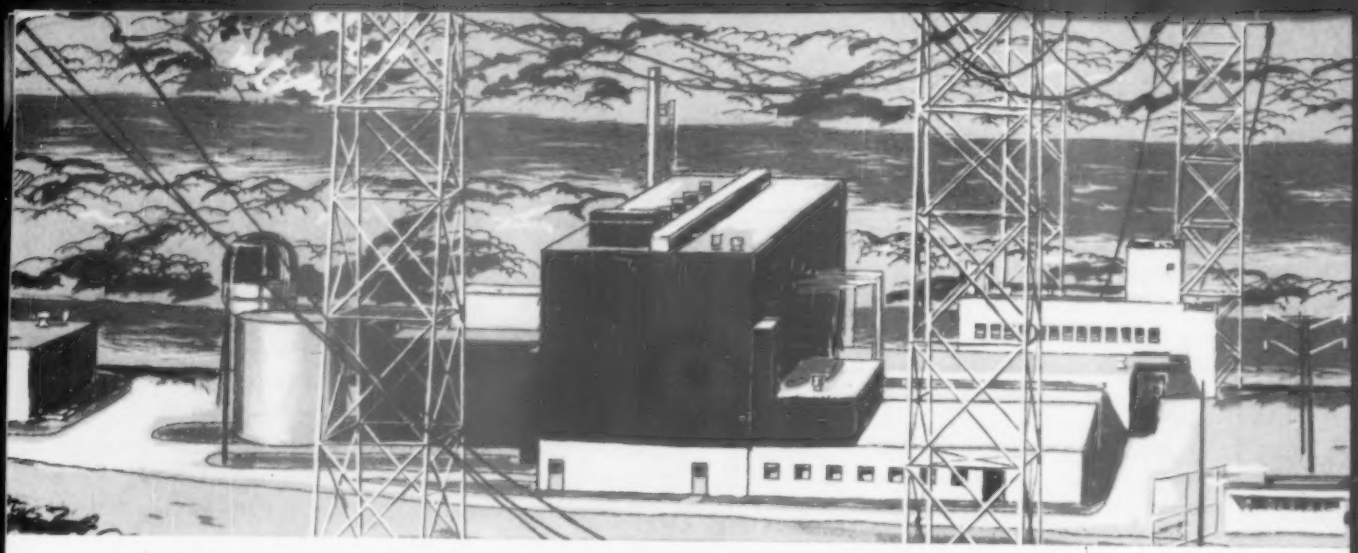
The Price Of Novelty

Our experience with tuition supplements indicates that this is an excellent plan, and we are glad to recommend it to other companies looking for an effective method of providing financial aid to higher education.

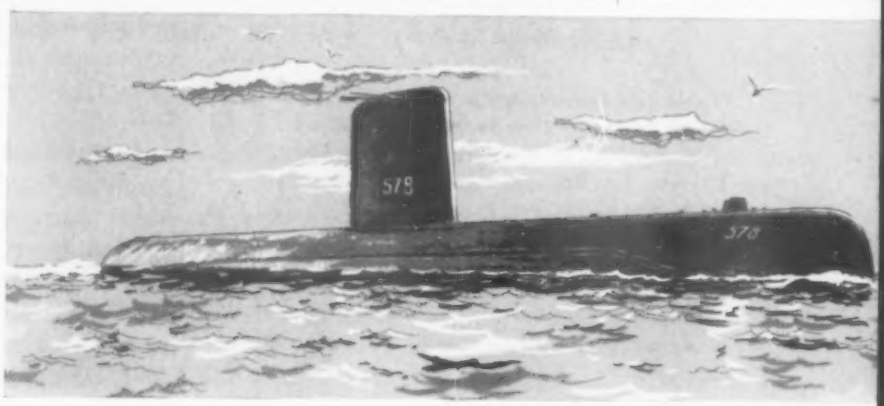
At any rate, we hope that business firms will not postpone granting financial aid until they find some novel way of doing it. If they do, it will be another case of too little and too late.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT
McGRAW-HILL PUBLISHING COMPANY, INC.

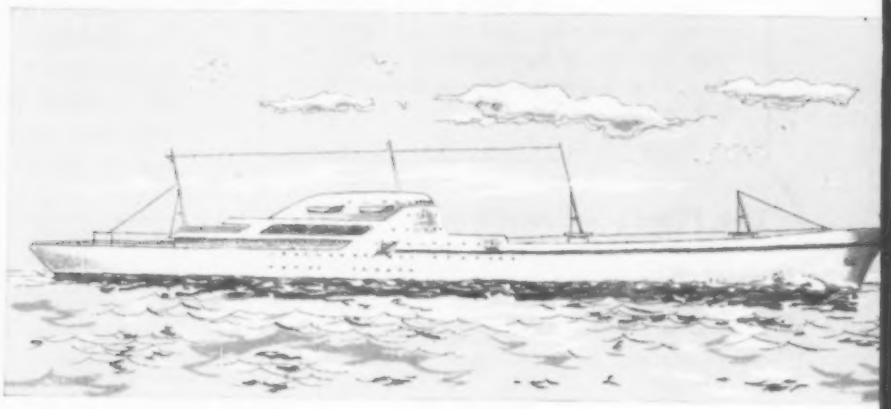


Shippingport Atomic Power Station—first United States full-scale central station atomic power plant devoted exclusively to civilian needs. First produced power on the line 12:39 A.M., December 18, 1957.



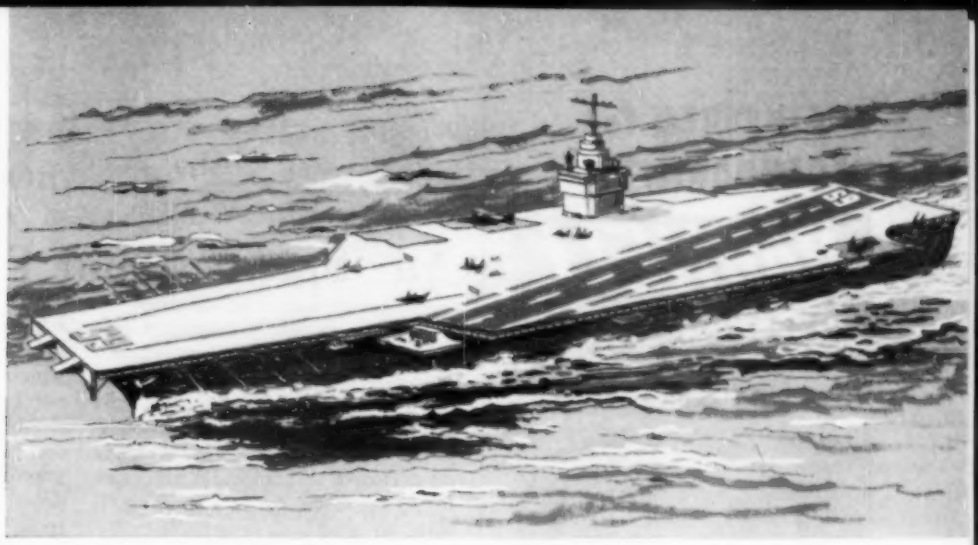
U.S.S. Skate—world's third nuclear-powered submarine. Crossed North Pole on August 11, 1958

Next time you have a heating problem, remember...

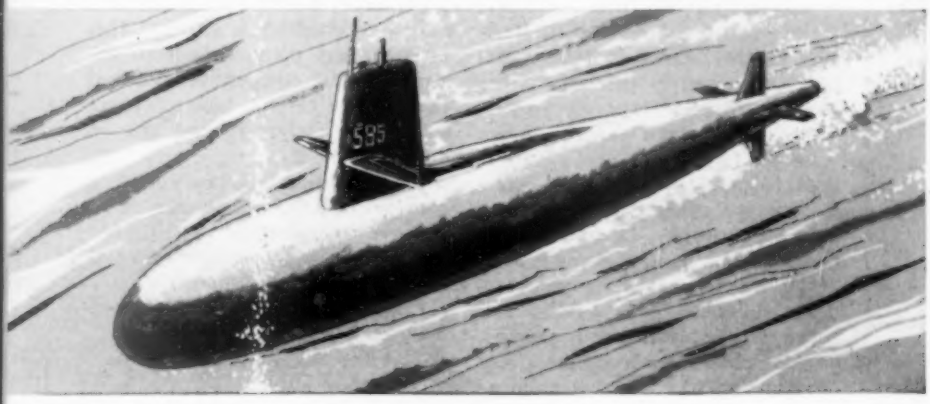


N.S. Savannah—world's first nuclear-powered merchant vessel. Launched July 21, 1959.

U.S.S. Nautilus—world's first nuclear-powered submarine. Completed first transpolar voyage August 5, 1958.



Enterprise — world's first nuclear-powered aircraft carrier. Now under construction.



U.S.S. Skipjack—world's most maneuverable submarine. Sea trials completed March 10, 1959.

CHROMALOX Electric Heat *solved* heating problems for all these projects

Heaters are installed in the primary systems of pressurized-water-type nuclear reactors to maintain the desired pressure control. *Each of the nuclear power projects illustrated uses hundreds of special Chromalox electric cartridge type heaters for this purpose.*

Chromalox electric heaters handle many other heating jobs in these projects. On the Nautilus, for example, fourteen different types of Chromalox heaters are used . . . for such applications as comfort heating, de-icing, maintaining lubricating oil temperatures, purifying air and water and cooking food.

Chromalox was first to make electric heating practical. Today, Chromalox has the world's most complete electric heating line, the largest stock and a nationwide network of Sales Engineering Representatives. Your Chromalox Man has the answers to *your* industrial, residential or commercial heating problems.

The Chromalox Library contains information on more than 15,000 different types, sizes and ratings of electric heaters and heating elements. Give us a brief outline of your problem and we will send you literature on heaters to do the job.

CHROMALOX
Electric Heat
INDUSTRIAL • COMMERCIAL • RESIDENTIAL
EDWIN L. WIEGAND COMPANY
7500 Thomas Boulevard • Pittsburgh 8, Pa.

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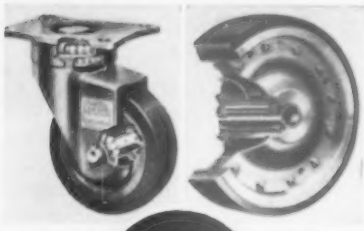
ENGINEERED for DEPENDABILITY,

DARNELL CASTERS & WHEELS

offer long range economy



A TYPE AND SIZE FOR EVERY PURPOSE

for added efficiency . . .

extra economy

RUBBER TREADS . . . a wide choice of treads suited to all types of floors, including Darnelloprene oil, water and chemical-resistant treads, make Darnell Casters and Wheels highly adapted to rough usage.

RUST-PROOFED . . . by zinc plating, Darnell Casters give longer, care-free life wherever water, steam and corroding chemicals are freely used.

LUBRICATION . . . all swivel and wheel bearings are factory packed with a high quality grease that "stands up" under attack by heat and water. Quick grease-gun lubrication provides easy maintenance.

STRING GUARDS . . . Even though string and ravelings may wind around the hub, these string guards insure easy rolling at all times.

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FACTORY ... BOOKS

Any Spies in Your Plant?

Could be! A special report, *Competitive Intelligence*, delves deep into the subject of how companies collect information about competitors. Tells both how it's done and how to combat it. So if your company depends on exclusive technological processes for its existence, here's a book you'll want to read.

To compile this detailed work, seven graduates at the Harvard Business School contacted nearly 300 business executives, primarily of the vice presidential level or higher. Companies reached ranged in size from the largest to those with less than 100 employees. Results show the greatest amount of information comes through "above-board" methods such as salesmen's reports of the analysis of published information. However, 27% of the 200 companies responding to a question on business espionage stated spying or other types of undercover information collection had recently been discovered in their industries. In fact, one professional "spy" bragged that he could crack any company and find out anything he wanted.

An example of straightforward misrepresentation comes from the admission of one investigator. How he gained admission to a manufacturer of razor blades, who advertised little but whose product was of such quality it consistently outsold a competing blade, is told in the following quotes:

". . . The competitor hired me (the investigator) to determine what type of machinery the company was using that enabled it to produce a better blade.

"I called on the production manager and told him I was a writer from a well-known trade magazine. My magazine was interested in publishing an article on the manufacture of razor blades. Would the manager be kind enough to show me around the plant?

"He was honored that his company had been selected and showed me his production facilities. I soon found out that it was not the machinery that produced a better blade; the company was using a special heat treatment not used by my client which improved the quality of the product."

How does the businessman protect his secrets? The report suggests measures to enable executives to protect themselves against losses of trade secrets. It also recommends a program for establishing an effective corporate intelligence activity. This program sets up guidelines to determine what competitive information is most helpful, how to collect it, how to analyze it, and how to make use of it.

In conclusion, the authors "are convinced of the importance of an effective competitive intelligence system in any organization—no matter how large or small."

Competitive Intelligence: Information, Espionage, and Decision-Making, by Burton H. Alden, Byron C. Campbell, et al. C. I. Associates, 25 George St., Watertown, Mass. 78 pages. $10.

Covers the Field in Production Control

Here's an especially good book for those who want to start with the fundamentals and rudiments of production control and work on up. One of the outstanding features of this work, *Production Control*, is the organization of material resulting in the separation of concepts and techniques.

Nyles V. Reinfeld actually divides the book into three parts. The first deals with concepts and gives the reader a run-down on principles and developments in the field to date. The second delves into the activities or techniques of production control. And finally, Mr. Reinfeld covers briefly the future of the field. In all sections charts and illustrations are used freely to give the reader added guidance.

Production Control, by Nyles V. Reinfeld. Prentice-Hall, Inc., Englewood Cliffs, N. J. 339 pages. $8.

For more facts Circle 548 on Reader Service Card ➤

RYKON *Grease*

passed this test at Corn Products Company

Situation: The springs in the grease chargers on expeller machines at Corn Products Company's Argo, Illinois, plant are under extra heavy tension. Due to this tension, oil formerly separated from the grease thickener in the grease cups. Bearings did not receive proper lubrication and the cups filled with grease thickener residue. The system needed cleaning every three months. Each time, large amounts of residue were found. Ten special-purpose greases were tried in an effort to solve the problem.

What was done: A Standard Oil lubrication specialist working with Corn Products' plant maintenance people recommended RYKON Grease #2 E.P. The system now needs cleaning only every six to nine months. Very little residue is found. Now RYKON Grease has become one of the important lubricating greases in use at Corn Products' Argo plant.

RYKON Grease is formulated with a unique non-soap organic thickener. The fibers of this thickener hold RYKON's fine quality base oil firmly in suspension. The grease resists water washing, high temperature and dirt contamination while providing superior lubrication to bearings of all types.

What you can do: Get more facts about RYKON Grease from the Standard Oil office nearest you anywhere in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.**

You expect more from **STANDARD** *and you get it!*

Standard's Arnold Parus and chief lubrication foreman Henry Anderson take a look at expeller unit's grease system. Arnold Parus is well equipped through experience and training to work with plant men on lubrication problems. Arnold has a B.S. degree from Bradley University and three years' field experience in this kind of work. He has also completed Standard's Sales Engineering School.

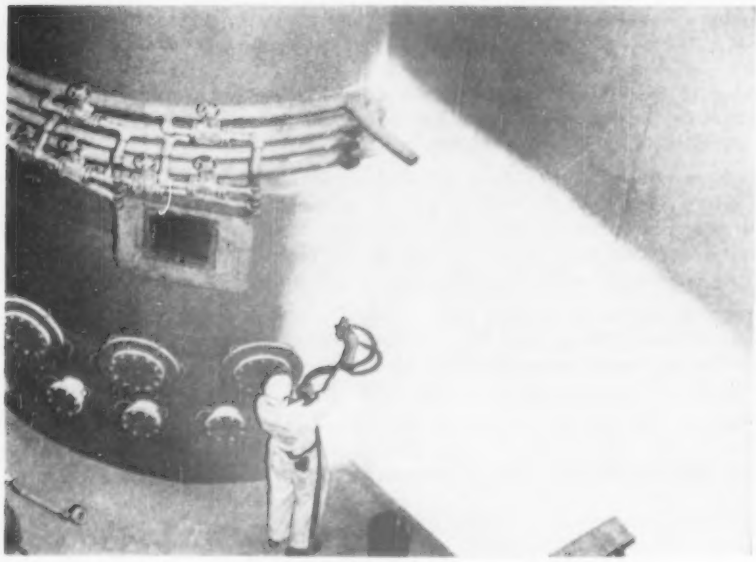
Quick facts about **RYKON** *Grease*

- Heat stable. At sustained high temperatures, RYKON Grease remains soft and grease-like.
- Resistant to water washing.
- Mechanically stable. Minimum change in consistency in service.
- Resistant to oxidation. Thickener acts as inhibitor.
- Exceptional rust preventive properties.

FACTORY

MATERIALS NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.



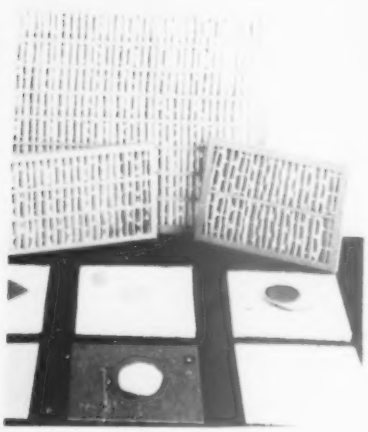
Epoxy Coating Resists Radiation

A radiation-resistant, waterproof epoxy coating based on a resin amine-cured system has been developed to protect concrete and steel walls. It's a two-part, cold-curing vehicle that requires a curing agent to complete the chemical reaction to harden the resin.

Same epoxy is used for the red primer coat, gray mastic coat (into which glass cloth is embedded), and the white finish coat. Final coat is sprayed over the gray mastic. Thickness requirements are 23 mils on concrete, 16 on steel.

This coating prevents leakage through concrete retaining walls from natural physical failure or failure from radioactivity. *Shell Chemical Corp.* (Circle 251).

Long-Life Filter Cloth Is Versatile



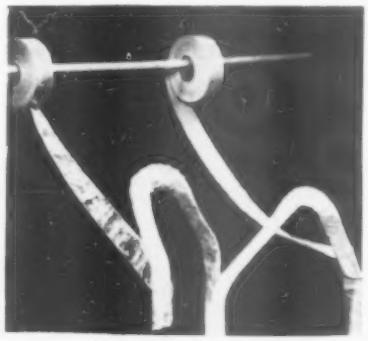
A new low-density, non-woven filter material, Hovolite, performs a wide range of filtration jobs. The material uses a microfine rayon fiber. Controlled, graded pore size affords more loading capacity and longer filter life. Applications include removal of all types of dust, mists, fumes, solids from liquids; noise absorption.

Since the material's thermoplastic properties make it heat-sealable to itself, it's easily laminated, heat-formed, or shaped. Available in thicknesses 0.1 to 1.0 in., in rolls, sheets, die-cut pieces, or fabricated parts. *Hollingsworth & Vose Co.* (Circle 252).

253—Hardboard that comes in V-grooved and smooth surface sheets has finishes that are authentic reproductions of finest grades of wood. Finishes are printed on tempered hardboard, coated and baked at 300 F. Each sheet is perfectly matched. *Panelboard Mfg. Co.*

254—Chemical Emulsion (Slix) controls and eliminates fire and accident risks caused by flammable spills on highways, streets, other areas. Slix shatters oil film into globules, coats each drop, then isolates it. Emulsion easily washes away with water. *The Penetone Co.*

255—Resin-Rubber Molding material is a medium-impact plastic with high abrasion and corrosion resistance. For products such as data bloc assemblies, gears, pulleys. Comes in colors. Molded parts can be painted, printed, cemented with solvents. *United States Rubber Co.*



Strong Mica Mat Tape

Here's a strong mica mat tape that's an all-purpose, form-wound coil insulator. It requires no varnish or bake treatment during application. Its dielectric strength is said to be about 30% higher than commonly used mica paper tapes. Standard 1¼-in. size provides excellent conformity on the "nose" sections of form-wound coils. *General Electric Co.* (Circle 256).

Turn the page

Can you put your finger on machining economies like this?

Cost of 800 brazed single point tools at approximately $3.50 each

TOTAL $2,800.00

Cost of 100 square CARMET INDEXABLE INSERTS with 800 cutting edges at

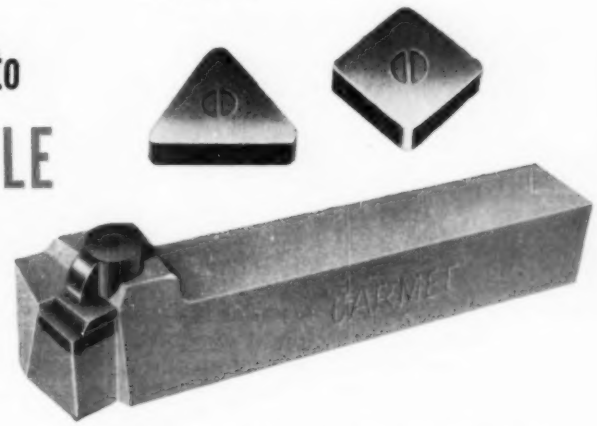
APPROX. $100.00

In addition to these savings on machining, you gain in high production rates, longer tool life, in longer tool storage and inventory, as well as tool change downtime.

Over 9 styles and 109 sizes Carmet cadmium plated tool holders. 6 carbide grades for machining almost all materials from wood and plastics to high alloy steels.

then it's time to switch to

CARMET® INDEXABLE INSERTS AND TOOL HOLDERS



See your Carmet Distributor now—or write to Carmet Division, Allegheny Ludlum, Detroit 20, Michigan.

147

Write for New-Revised CATALOG C-16-B
CARMET CEMENTED CARBIDES FOR INDUSTRY

This 32-page book contains revised prices and complete specifications on Carmet's full line of cemented carbide tipped tools, blanks and holders. Speed and feed charts, grade comparisons and ordering information included.

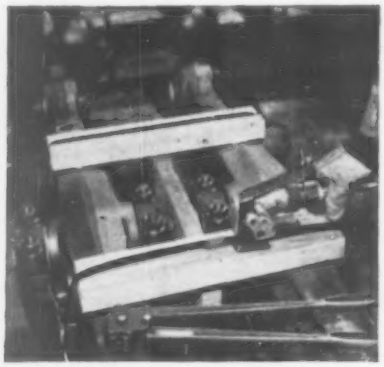
ADDRESS DEPT. F-24

CARMET

CEMENTED CARBIDE DIVISION OF
ALLEGHENY LUDLUM STEEL CORPORATION

Seven SIGNODE ways to strap better for less ...at the speed you need

Basic two-piece tool set; easy to use. An inexpensive outfit, including seals, strapping, strap dispenser, stretcher and sealer, saves time and money in any shipping room.



Model N air-power stretcher tightens strapping to preset tensions up to 1600 pounds. Model PN, not illustrated, straps bundles of round or irregular shape.

Signode's SFC—the only one-hand, one-piece strapping tool—shown here with Signode Adjusta-Pak three-way-telescoping corrugated container.

Model AP portable air-power strapping machine—a fast, dependable air-powered tool that tensions, seals, cuts off strap. Preset tensions up to 1600 lbs. Also electric—Model AE.

Model PSF, Power Strap Feeder—now one man straps big packages without a helper and without walking around the package. Inexpensive. Used with any Signode seal feed tool.

Conveyor strapping station holds interlocking container flanges, positions strapping, supports tools, saves time and labor. Handles large-volume flow of various size cartons.

Model M-2 power strapping machine automatically tensions, seals and cuts the strapping. Speeds and improves convevor line strapping of all types of containers.

It will pay you to see the Signode man near you. He has strapping tools, machines, and accessories to meet your requirements, and can help you with time-saving, cost-cutting packing and strapping methods. For fast service, write, describing your needs to.

SIGNODE STEEL STRAPPING CO.

2663 N. Western Avenue, Chicago 47, Illinois

Offices Coast to Coast. Foreign Subsidiaries and Distributors World-Wide
In Canada: Canadian Steel Strapping Co., Ltd., Montreal • Toronto

First in steel strapping

For more facts Circle 550 on Reader Service Card

FACTORY / MATERIALS NEWS

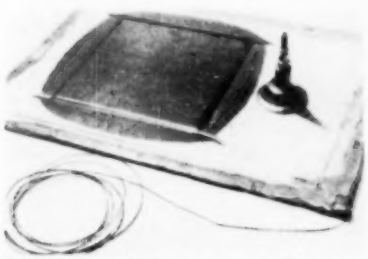
Begins on page 184

For more about these items, circle item numbers on Reader Service Card next to back cover.

257—Cutting-Grinding Coolant is for operations needing exceptionally fine tolerances. Kleer-60 provides high penetration around cutting edge of tool or wheel even at high cutting speeds, thus reduces friction, improves surface finish. *Shear-Speed Chemical Products.*

258—Blue-Gray Powder has unusual lubricating properties. Molysulfide is unaffected by radiation, films out on metal surfaces, provides durable bond, stays thermally stable. Can be used as dry lubricant and as additive for greases and oils. *Climax Molybdenum Co.*

259—Vibration and Sound Deadener is a flexible vinyl plastic sheet mixed with metallic lead powder and backed with woven fibrous glass cloth, cotton duck, or other fabrics. Coustifab is also available with pressure-sensitive adhesive backing. *Cordo Chemical Corp.*



260—Ventcloth is a combination bleeder cloth and parting film. Woven glass fabric is impregnated with a good parting agent. Useful in metal bonding, and in fabricating electrical and structural laminates. *Narmco Resins & Coatings Co.*

261—Drinking Water Filter, for use on a separate cold water line, removes all water-borne bacteria. Special silver impregnation of filter unit releases a measured amount of silver ions to maintain constant sterilization. To clean: disassemble and brush. *Filtros Inc.*

Turn the page

THE SWING IS TO "Dixylon!"

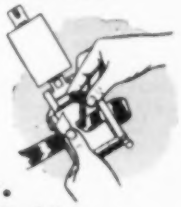
Revolutionary, All-Synthetic Belting Is Proving Superiority In Application After Application

Dixylon has established new concepts in belting performance, value, versatility . . . the swing is to Dixylon for heavy and light power transmission, for high speed, machine tool drives, printing tapes, spinning tapes, conveying belts, numerous other uses. Check these advantages . . .

Stretch-free—runs for years without idlers or take-up.
High Tensile Strength—very thin Dixylon belting can be used at amazingly high speeds, and for small pulley diameters.
Great Durability—gives long, maintenance-free service life.
Non-Slip—high frictional coefficient . . . no belt dressing required.
High Resistance to oils, greases, most acids. Non-absorbent.

A Special Dixylon Plus Value . . . Can Be Made Endless In Minutes Without Lacing Or Sewing—

The speed and ease with which Dixylon can be joined saves downtime, reduces need for carrying large stocks of endless belting.



R. & J. Dick COMPANY, inc.

Leaders in the Development and Manufacture of Power Transmission and Conveying Equipment

TOTOWA, NEW JERSEY • CLifford 6-6400

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SEND COUPON FOR CATALOG

R. & J. DICK COMPANY, Inc.
Dept. 15L Totowa, New Jersey

Please send a free copy of your catalog, "Dixylon — A Modern Synthetic Belting."

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COMPANY _____

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CITY _____ ZONE _____ STATE _____

Multi-plant conveyor conversion problem solved with

Standard Conveyor stock units

Gould-National makes full conversion in 90 days

Gould-National Batteries, Inc., makes batteries for hundreds of sales organizations, each having its own color combinations in trade marks and brand names, some requiring as many as three distinct shades. And Gould-National, to insure distribution of fresh batteries everywhere in the country, manufactures in 16 strategically located plants throughout the United States.

Battery manufacture is a highly standardized, mass-production operation. Economical application of painted multiple colors on the cases posed real problems in methods and equipment. The conversion at Gould-National required equipping 16 plants simultaneously with painting equipment and conveying systems coordinated with existing production lines.

Methods engineers at Gould-National made the multi-plant conversion in the record time of 90 days . . . using Standard Conveyor stock units, including Handidrive power unit, with big savings in cost. And what do these engineers say about Standard Conveyor? "Best possible method for our type of operation!"

Illustrated are scenes from the St. Paul plant of Gould-National. Line was designed to produce 3,000 multi-colored batteries in 50 different sizes and colors per day.

When you have a materials-handling problem, call Standard — more than 50 years of conveyor engineering experience. Standard Conveyor Company, General Office: North St. Paul 9, Minnesota.

OVER 50 YEARS of conveyor experience

Call the Standard engineer listed in your classified phone directory or write direct for Bulletin 309 —address Dept. G-12.

Standard

GRAVITY & POWER CONVEYORS

Sales and Service in Principal Cities

FACTORY / MATERIALS NEWS

Begins on page 184

For more about these items, circle item numbers on Reader Service Card next to back cover.

MATERIALS LITERATURE

262—Nylon Shapes for various applications are described in 8-pager (BR-2M). It demonstrates through 22 case histories how nylon's properties can be cost-savers. Illustrated. *The Polymer Corp. of Pa.*

263—Adhesive Bonding of aluminum is subject of small 20-page booklet (Form 802-21-7). Includes information on joint design, types of adhesives, processing of adhesive joints, strength ranges, applications. *Reynolds Metals Co.*

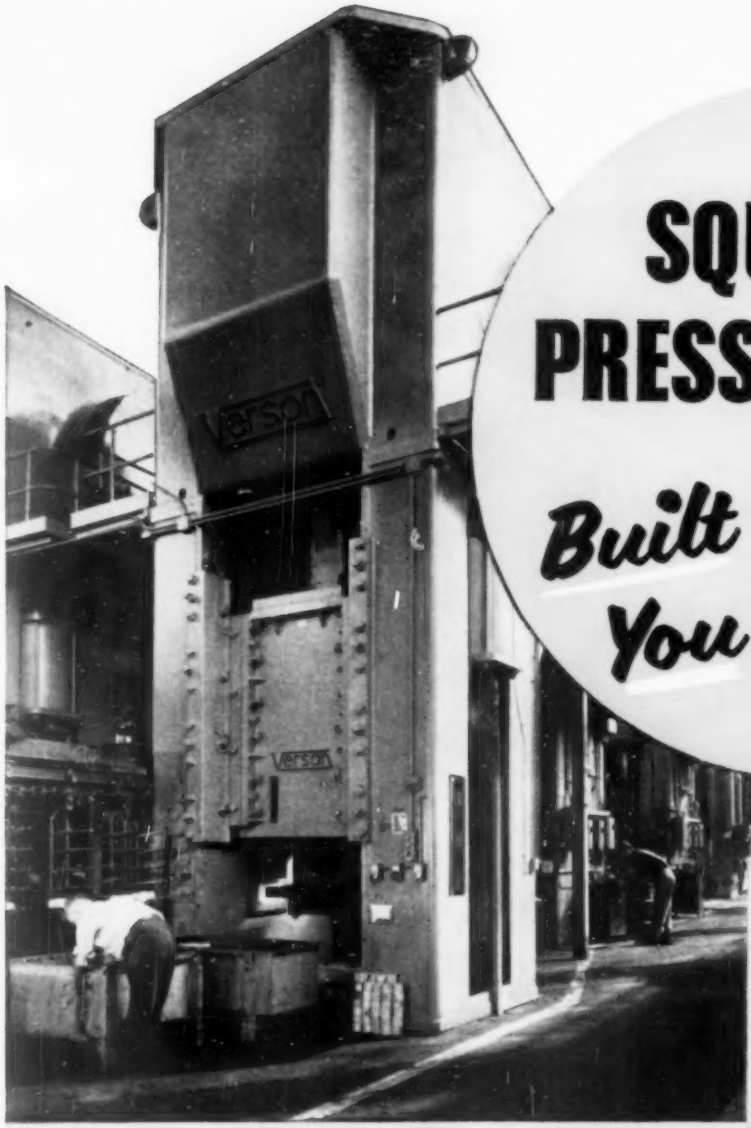
264—Inhibitor to prevent moisture damage and corrosion on metal surfaces is covered in 6-pager. Liquid formula, CRC2-26, is for manufacturing and other uses in electrical and electronic fields. *Corrosion Reaction Consultants, Inc.*

265—Plastics and Coating products are among the 375 industrial chemicals included in this 44-pager. Describes properties and uses of plastics and coatings, automotive chemicals, textile fibers, other products. *The Dow Chemical Co.*

266—Silicone Rubber Compounds are featured in Bulletin CDS-170A (12 pages). Contains information on properties and data for RTV compounds —20, —40, —60, —90, and new silicone rubber sponge. *General Electric Co.*

267—MN Wrought Iron, a specialty alloy containing about 1% manganese, is described in 8-page booklet. Charts show metal's improved impact resistance at subzero temperatures. Provides data on corrosion. *A. M. Byers Co.*

268—Specialty Steel for many uses is covered in 40-pager titled "Your Guide to Selection of Specialty Steels." Includes data on tool and die steels, stainless steels, high temperature alloys, other steels. *The Carpenter Steel Co.*



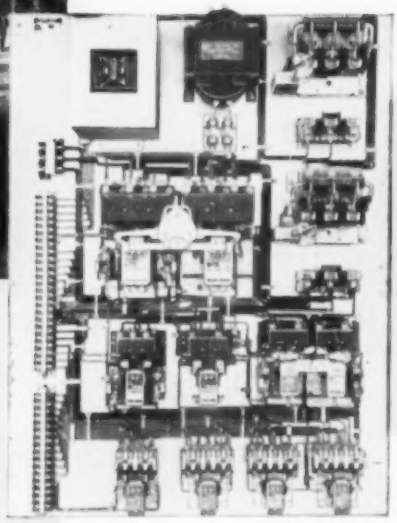
SQUARE D PRESS CONTROL

Built the Way You Want It!

Square D control is used by virtually every stamping press manufacturer in the country—and is approved by the three largest automobile manufacturers.

What's behind this preference for Square D? Biggest reason, we believe, is *completeness* of line which enables us to *custom build* to individual requirements, using *standard* control components. Actually, that has a bearing on a lot of things—including delivery, safety, uninterrupted production, maintenance parts standardization, plus field engineering service.

On the next press you buy, specify SQUARE D CONTROL.



above • typical Square D press control panel, designed and built to customer specifications, using standard components

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY

For more facts Circle 553 on Reader Service Card

Discover the difference in Sylvania . . .

Sylvania Light Bulbs for every socket in the home provide the same benefits enjoyed by American industry.

Sylvania Silver White Mercury Lamps give you up to 16% more light than other types.

Convair B-58 "Hustler"—
America's first super-
sonic bomber

The manufacturer of America's first supersonic bomber reports:

"Sylvania Very High Output fluorescents helped us break the 'light barrier' at Convair!"

B. G. Reed, Assistant Division Manager—Operations
Convair Division, General Dynamics Corp. (Fort Worth)

With the help of Sylvania-installed VHO fluorescents, Convair-Fort Worth engineers have nearly tripled the light intensity on work surfaces at their 225,000-square-foot precision manufacturing plant in Fort Worth, Texas.

Convair craftsmen now produce B-58 "Hustler"* jet bombers under superior lighting conditions of nearly 3 times the intensity provided by their previous lighting system.

Do you need more usable light in your factory? Let your Sylvania supplier show you how you can get the most light for your money with Sylvania VHO fluorescents.

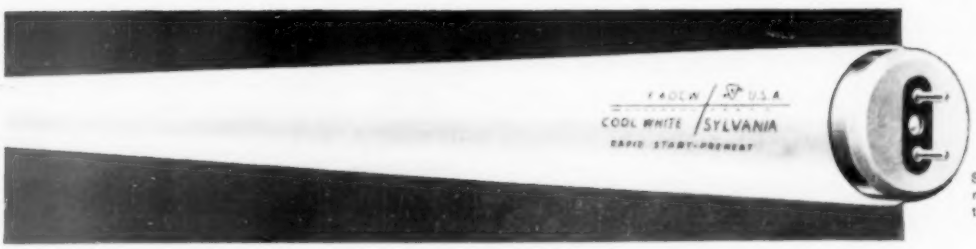
They're guaranteed by Sylvania's exclusive "Light Insurance Policy." If you don't agree that they give better performance, appearance, brightness and lamp life than any other brand, *you can return them for a full refund!*

For a sample copy of the *Sylvania Light Insurance Policy* on VHO fluorescent lamps, write to:

SYLVANIA LIGHTING PRODUCTS
VHO Department 9L-3112,
60 Boston Street,
Salem, Massachusetts

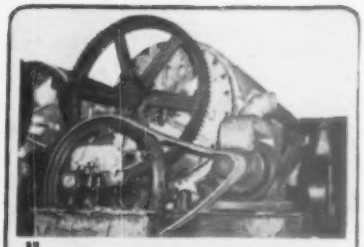
SYLVANIA
Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

*Sylvania Electronic Systems manufactures the "Electronic Shield" for the B-58 "Hustler"—an electronic counter measures system which repels any missile or offensive weapon sent up to attack the aircraft.



Sylvania Fluorescent lamps maintain more than 7% greater output throughout useful lamp life.

For more facts Circle 554 on Reader Service Card



"THIS LUBRICANT INCREASED CHAIN LIFE 4 TIMES"

—says FASTERFAT, Division of National Sea Products Limited

"Two years ago we switched from the lubricant we were then using to your LUBRIPLATE, and we are pleased to inform you that we have had very excellent satisfaction from its use. High speed silent chains on the drives of our fish meal cookers, which were formerly worn out in about six months, are still in service after two years."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

MAINTENANCE

346—Damp-proofing Adhesives. Booklet gives properties and uses for walls and concrete surfaces. Swift & Co.

347—Combination Scrubber-Vacuum. Literature describes features and adaptability. Finnell System, Inc.

348—Lubricants. "Lubriplate Data Book" is a helpful treatise on lubrication. Lubriplate Div., Fiske Bros.

349—Dust Collectors. Literature on single machine types presents choice of 46 models. Aget Mfg. Co.

350—Paint. Comprehensive illustrated book explains principles of color dynamics. Pittsburgh Plate Glass Co.

351—Lubricants. Free copy of "Management Practices that Control Costs via Organized Lubrication." Texaco, Inc.

STORAGE, CONTAINERS

352—Paper Bags. Booklet CP-1 describes dozens of ways to cut costs in shipping. Union Bag-Camp Paper Corp.

353—Storage Racks. Catalog gives full details on slide and lock adjustable racks. American Metal Products Co.

354—Steel Shelving. Catalog gives complete data and features of flexible steel shelving. Borroughs Mfg. Co.

MATERIAL HANDLING

355—Containers. Full information on versatile stack-type tote pans of rugged construction. G. B. Lewis Co.

356—Self-Dumping Hoppers. Details upon request. Five sizes, ½- to 2-yd. capacity. Roura Iron Works, Inc.

357—Stacking Boxes. Information gives structural features. Save time, money, storage space. Republic Steel Corp.

358—Monorail and Cranes. Booklet (52 pages) contains latest and complete information. Louden Machinery Co.

359—Conveyor Belts. Bulletin M302 provides data, describes heavy-duty belts. Manhattan Rubber Div.

360—Tramrails. Free copy of Engineering and Data Booklet 2008. Illustrated. Cleveland Crane & Engineering Co.

361—Screw Conveyors. Book 2989 shows 17 basic screw designs and full line of components. Link-Belt Co.

362—Lift Trucks. Brochure #1535H on warehouses—capacities of 2000, 3000, 4000 lb. Yale & Towne Mfg. Co.

363—Lift Trucks. Bulletin F-50-T gives information on new electric fork truck. Elwell-Parker Electric Co.

364—Lift Trucks. Folder F-37 provides complete data on new narrow-aisle stacking truck. Towmotor Corp.

365—Crane Trolleys. Catalog gives detailed information, designs, and capacities. Euclid Crane & Hoist Co.

366—Monorail Cranes. Free literature describes unique interlocking monorail system. American Monorail Co.

367—Conveyors. Bulletin 309 has data on multi-conveyor units from standard stock units. Standard Conveyor Co.

368—Wire Rope Slings. Here's a free revised and enlarged edition of famous sling handbook. Union Wire Rope Corp.

369—Lift Trucks. Complete new catalog and price list on 35 new model lift trucks. Crown Controls Co. Inc.

370—Battery Chargers. New brochure (No. 6259) has data on new vertical design type. Electric Storage Battery Co.

371—Cranes. Bulletin C-42 is packed with information, including structural data and capacities. Harnischfeger Corp.

372—Hoists. Bulletin H-20 is yours for asking. Has full information on precision hoists. Harnischfeger Corp.

PRODUCTION

373—Data Processing. Brochure FS-43 tells about system for controlling factory operations. Royal McBee Corp.

374—V-Drives. Bulletin M141 has descriptive data and drive specifications. Manhattan Rubber Div., R-M.

375—Heat Exchanger. Bulletin 132 gives data on self-contained fluid cooling system. Niagara Blower Co.

376—Belting. Free catalog. "Dixylon—A Modern Synthetic Belting," gives complete facts. R. & J. Dick Co.

Turn to page 196

Cleaner, cooler operation . . . less maintenance . . . longer, trouble-free life

HERE'S WHY: Ordinary d-c motor ventilation systems draw air in at the commutator end, contaminate windings by drawing carbon dust from commutator brush wear *into* the machine. In the new Life-Line' "H," this air flow is reversed. Air and carbon dust are expelled at commutator end . . . assuring cleaner, cooler windings . . . longer motor life . . . less maintenance.

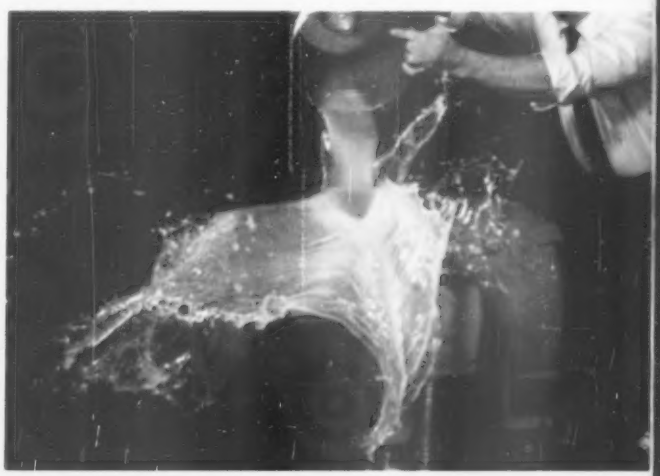
Plus . . . these other important advantages .....

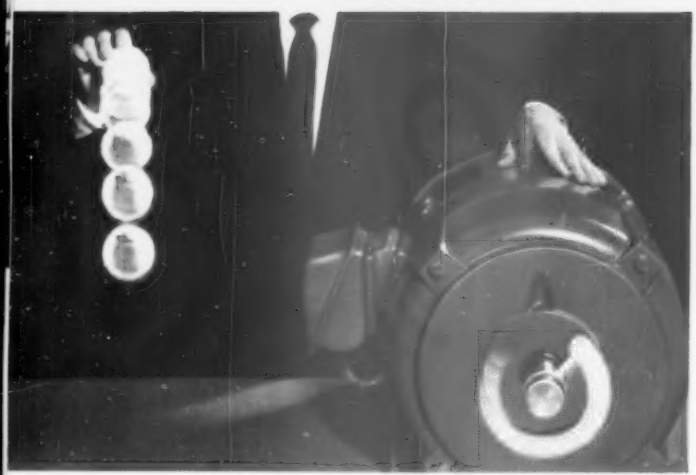
YOU CAN BE SURE...IF IT'S Westinghouse

These exclusive features of the new Westinghouse Life-Line H d-c motor guarantee top performance . . . longer, trouble-free life

TEN TIMES LONGER INSULATION LIFE . . . New silicone insulation in Westinghouse Life-Line* "H" d-c motors and generators stands up under temperatures which turn ordinary insulation to a cinder. High-temperature silicone insulation is used with the full complement of iron and copper required for low Class B temperature. Result: Life-Line "H" shrugs off emergency overloads and abnormal ambients to keep production rolling, maintenance down.

GREATER PROTECTION . . . most complete and advanced protection available in dripproof industrial d-c machines. Elimination of uncovered side openings . . . heavy, cast end brackets . . . effective seals throughout . . . all combine to provide outstanding resistance to liquids, vapors and dirt. This means longer life with greater reliability . . . minimum maintenance under all operating conditions.





FASTEST RESPONSE . . . 35 per cent increase in commutating ability . . . up to 55 per cent lower mechanical inertia . . . and up to 30 per cent reduction in electrical inertia mean that the new Westinghouse Life-Line "H" d-c motor provides the fastest acceleration, quickest reversing and closest speed regulation. This means more production, better product quality, minimum complexity of control.

SIMPLIFIED MAINTENANCE . . . With the new Life-Line "H," maintenance is not only substantially reduced but periodic inspections are also greatly simplified. For example: as shown above, Uniforce brushholder fingers lock out . . . brushes can be inspected or changed with one hand. And Uniforce tension remains constant throughout brush life . . . no need to adjust pressure as brushes wear.

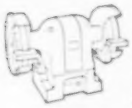
For information about the ways you can profitably put the new Life-Line "H" motor to work, contact your nearby Westinghouse representative. Or, write Westinghouse Electric Corporation, P. O. Box 868, 3 Gateway Center, Pittsburgh 30, Pa. J1-22122

YOU CAN BE SURE... IF IT'S Westinghouse

3 ways to cut costs in grinding–

–all power-built by Black & Decker!

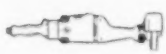
Whether you must take the work to the tool or bring the tool to the work, Black & Decker gives you a choice of grinders to save time and money.



Powerful B&D Bench Grinders save steps—speed up jobs when strategically located about your shop. Smooth running B&D motors give more constant speed, regardless of load. Four models: 6″ to 10″ sizes.

Precise light-weight B&D Die Grinders deliver top quality work at high speeds whether shaping, burring or grinding. Handle as easily as a pencil. Vibrationless—perfectly balanced from one end to the other. Smooth operation—perfect for carbide bit use. In sizes #8, #12, #20.

For more facts Circle 557 on Reader Service Card



Time saving B&D Portable Grinders go to the work where surfaces must be prepared for welding and finishing. Perfect for smoothing welds, snagging and grinding castings and countless other grinding, cleaning and buffing jobs. 2½″, 5″ and 6″ sizes available.

50th YEAR

Leading Distributors Everywhere Sell

Black & Decker®

QUALITY ELECTRIC TOOLS

MAIL TODAY FOR FREE DEMONSTRATION

THE BLACK & DECKER MFG. CO., Dept. 0712
Towson 4, Md. (In Canada: Brockville, Ont.)

☐ Please arrange a demonstration of a B&D Grinder.

☐ Please send additional information on.....

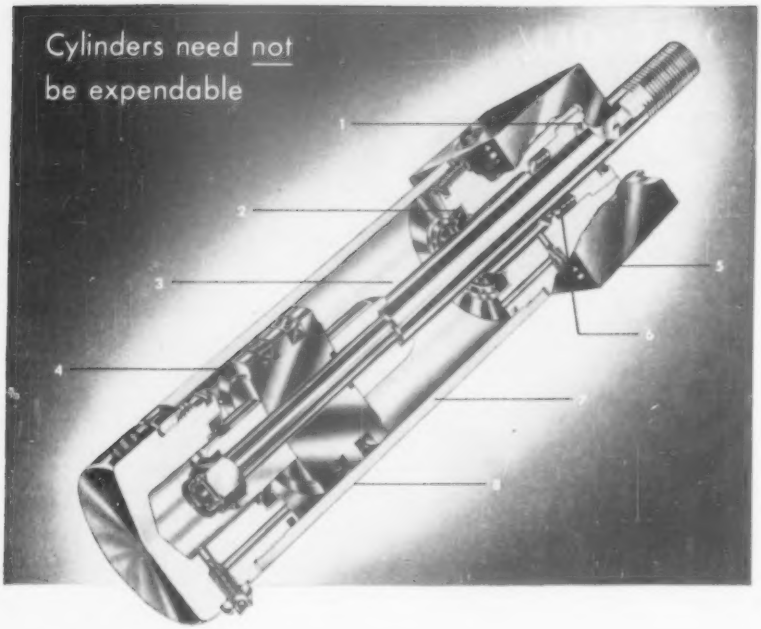
Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

☐ Drills ☐ Sruguns® ☐ Magnetic Drill Presses ☐ Sanders



Specify the

T-J Spacemaker

for longer, more efficient cylinder service

You too—can reduce replacement expenditures—lower maintenance costs with the T-J Spacemaker cylinder line. Designed and engineered for ruggedness, and accuracy of operation, the Spacemaker assures longer, uninterrupted operation.

The T-J Spacemaker eliminates tie-rods, gives greater strength, saves space . . . and reduces costs in all push-pull operations. Immediate delivery in a complete range of styles and capacities . . . air or oil. Write for Bulletin SM 155-4, today. The Tomkins-Johnson Company, Jackson, Michigan.

WITH EXTRAS . . . AT NO EXTRA COST

1. METAL PISTON ROD SCRAPER—protects rod packing, cylinder bore and rod surface by removing all foreign particles.
2. NEW "SUPER" CUSHION for air or METALLIC SELF-ALIGNING MASTER CUSHION for oil.
3. HARD CHROME PLATED CYLINDER BORES AND PISTON RODS for greater protection and reduced wear.
4. ONE PIECE PISTON assures better alignment, longer bearing and packing life.
5. FORGED SOLID STEEL HEADS throughout entire line.
6. PILOTED PACKING GLAND with extra long bearing for additional strength and support to piston rod.
7. NO TIE-RODS TO STRETCH—gives you 360° port rotation . . . less space used . . . full strength.
8. STREAMLINED DESIGN . . . operating pressures to 200 PSI, air; 1,000 PSI oil, non-shock.

T-J TOMKINS-JOHNSON
RIVETORS . . AIR AND HYDRAULIC CYLINDERS . . CUTTERS . . CLINCHORS

ADVERTISERS' LITERATURE

Begins on page 192

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

377—Reproduction Materials. Booklet on reproduction materials is free upon request. Eastman Kodak Co.

378—Temperature Control. Application data sheets for temperature-control tanks, vats, processes. Fenwal, Inc.

379—Power Tools. Industrial tool catalog (58 pages) contains detailed information on over 100 tools. Skil Corp.

380—Flexible Hose. Describes features and applications of new Springfield "400" Teflon hose. Titeflex, Inc.

381—V-Belt Drives. Free bulletin gives complete details of new Dyna-V-belt drive line. Dodge Mfg. Corp.

382—Speed Reducers. Helpful bulletin provides complete data on shaft-mounted types—55 models. Dodge Mfg. Corp.

383—Bearings. Bulletin offers information on ball and roller bearings for varied applications. Dodge Mfg. Corp.

384—Couplings, Sprockets. Bulletin contains data on line of chain couplings and sprockets. Dodge Mfg. Corp.

385—Drills. Bulletin 92-121 describes new air-feed drill with air check feed control. Gardner-Denver Co.

386—Carbides. Revised catalog C-16-B tells all about cemented carbides for industry. Allegheny-Ludlum Steel Corp.

387—Ultrasonic Cleaning. Informative paper covers ultrasonic cleaning techniques. Detrex Chemical Industries.

388—Damper Operators. Bulletins D-251, 255 and 265 have full details on piston-type models. Johnson Service Co.

389—Photo Panels. Booklet gives uses for directories, catalogs; price and parts list. Acme Visible Records, Inc.

390—Heat Exchangers. New bulletin (P-60) provides specifications, applications, other data. Tranter Mfg., Inc.

BUILDINGS

391—Rubber Doors. Illustrated catalog gives data, discusses low-maintenance features. Stic-Klip Mfg. Co.

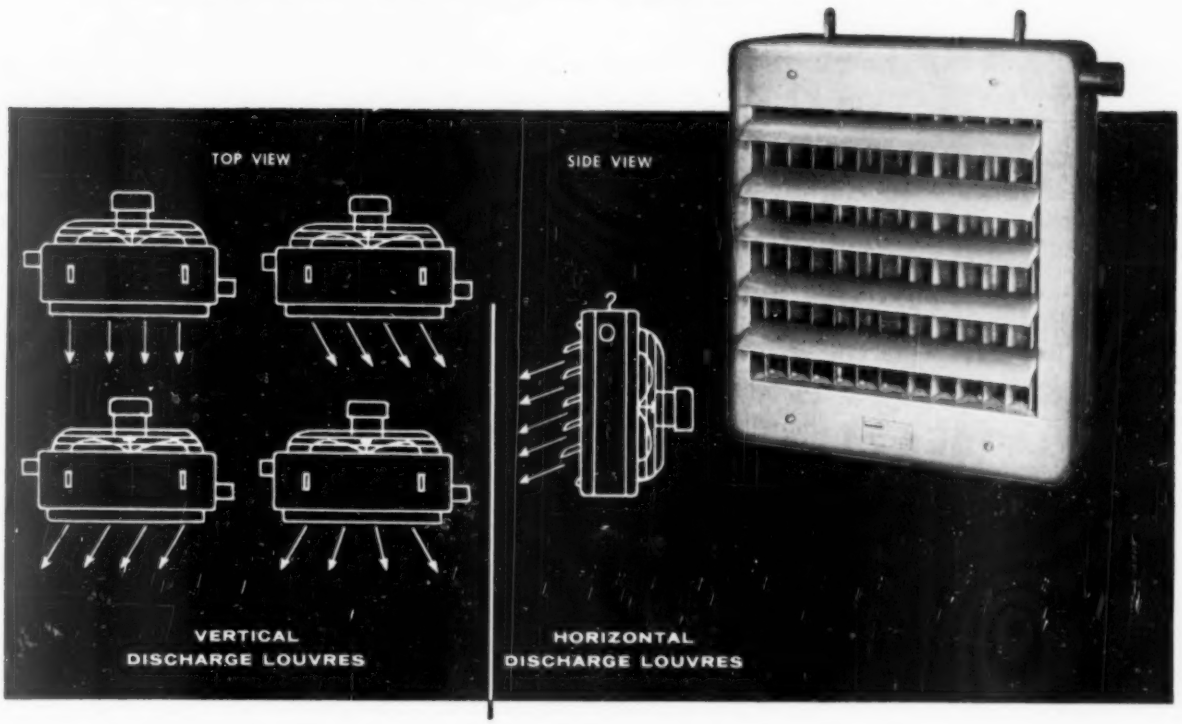
392—Complete Buildings. Literature describes features. Buildings are available in six colors. Stran-Steel Corp.

393—Corrugated Transite. Here's a free 32-page brochure, "Corrugated Asbestos Transite." Johns-Manville Corp.

Turn the page

New DUNHAM-BUSH Type "H" UNIT HEATERS

CONTROL BOTH HEAT SPREAD and THROW



Arrangement of both horizontal and vertical discharge louvres (standard equipment—no extra cost) in these new unit heaters affords efficient control of both heat spread and distance of throw.

This dual control effects extra efficiency and extra economy required in factories, commercial and institutional buildings, making Dunham-Bush Type "H" the best unit heater buy for such installations.

The new Dunham-Bush Unit Heaters are designed for either steam or hot water systems. Capacity range is from 65 to 1200 EDR. Working pressures are up to 150 psi.

Long life is assured with aluminum heating element fins; copper tubes with permanent mechanical bond; phosphatized rust resistant steel casing; motor support doubles as fan guard. Motors are sleeve bearing—single and three phase.

Send for File 1306C listing sizes, capacities and other technical data.

Dunham-Bush, Inc.

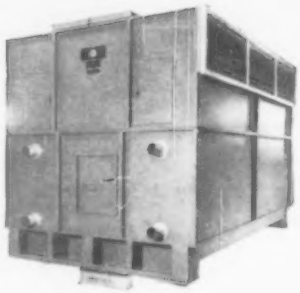
WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

This Self-Contained Fluid Cooling System

... gives most accurate temperature control



Applied in cooling industrial machines or processes to temperatures approaching the ambient wet-bulb, the NIAGARA *Aero* HEAT EXCHANGER is independent of any more than a nominal water supply or disposal. The coolant system is a closed one, free from dirt and maintenance troubles.

Heat is removed from your process *at the rate of input*, giving you precisely the temperature you require and assuring the quality of your product. Heat may be added to prevent freezing in winter or for better control in a warm-up period. Liquids or gases are cooled with equal effectiveness.

Heat is rejected outdoors. Only the little water evaporated on the cooling coils in the air stream, or discharged to prevent hardness build-up, is consumed.

Niagara sectional construction saves you much installation and upkeep expense, gives full access to all interior parts and piping. Your equipment always gives you full capacity and "new plant" efficiency.

Write for Niagara Bulletin No. 132 for complete information

NIAGARA BLOWER COMPANY
Dept. F-12, 405 Lexington Ave., New York 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada
For more facts Circle 560 on Reader Service Card

Send for FREE SAMPLE of "SAFETY-WALK"

amazing non-slip surfacing material

MAKE YOUR FACTORY SAFER with "SAFETY-WALK"; gives perfect traction, sure footing, even under water, oil, or grease! Strips, tiles, cleats, apply in minutes . . . last for years. Four colors . . . easy to keep clean. For stairs, walkways, ramps, indoors and out. Pays off in accident prevention; prevents costly claims; improves employee efficiency.

"SAFETY-WALK" is a registered trademark of 3M Co., St. Paul 6, Minn.

Minnesota Mining and Mfg. Co.,
St. Paul 6, Minn., Dept. AAE-129

Please send me a free sample of "SAFETY-WALK" and complete information.

NAME_____
TITLE_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

SAFETY-WALK BRAND Non-Slip Surfacing

MINNESOTA MINING AND MANUFACTURING COMPANY
...WHERE RESEARCH IS THE KEY TO TOMORROW
3M COMPANY

ADVERTISERS' LITERATURE

Begins on page 192

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

394—Plant Sites. Confidential report on facilities and services for plant location. Tidewater Va. Development Council.

395—Rolling Steel Doors. Catalog G-60 gives complete structural data, specifications, and sizes. R. C. Mahon Co.

396—Plastic Glazing Panels. Literature explains features and economies of plastic panels. Butler Mfg. Co.

ELECTRICAL

397—Motors. Complete details on custom-built air-cooled motors. Polyphase 50 or 60 cycles. Valley Electric Corp.

398—Purchasing Guide. Bulletin GED-3877 has information on guide to productive purchasing. General Electric Co.

399—Motoreducers. Bulletin 3100 describes equipment with range to 75 hp., 1.2 to 780 rpm. The Falk Corp.

400—High-Voltage Cable. Publication DM 5903 gives complete details and features. Anaconda Wire & Cable Co.

PLANT SERVICES

401—Metal Lumber. Here's information on slotted angle for varied in-plant framing needs. Republic Steel Corp.

402—Steel Lockers. Complete data on design features of lockers finished in baked enamel. Republic Steel Corp.

403—Unit Heaters. File 1306C lists sizes, capacities, technical data on new type "H" models. Dunham-Bush, Inc.

404—Compressors. Bulletins 16B8244 and 16B8126 give data on rotary compressors. Allis-Chalmers Mfg. Co.

405—Rust Preventive. Two charts: "Government Specifications" and "Industrial Comparison." Valvoline Oil Co.

406—Soundproof Panels. Free folder tells how they can help you solve your sound problems fast. The Eckel Corp.

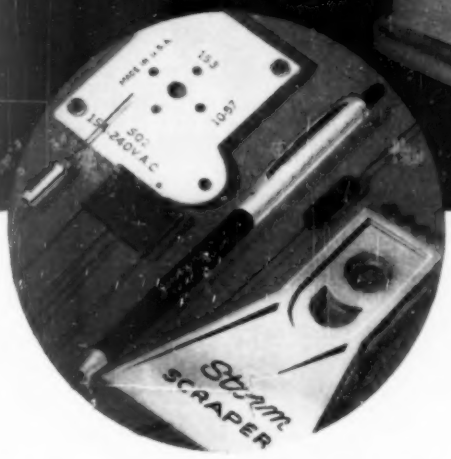
407—Cabinets. Catalog 106 gives data on versatile and functional enclosure systems. Elgin Metalformers Corp.

408—Hose. Bulletin 7075 describes line of flexible hose for varied applications. Manhattan Rubber Div., R-M.

409—Pumps. Get Bulletins 953-K, 955-R, 980-D, 982-A for details on liquid-moving pumps. Buffalo Pumps Div.

Turn the page

capable "COMPANION" for short run marking:



- **gives "big machine" imprint quality**
- **at a fraction of the cost**
- **with no production line delays**

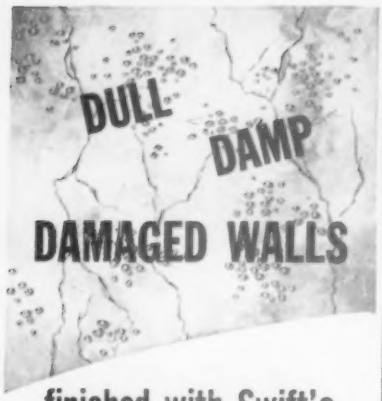
You want your sample quantities and limited runs to have the same good, clear marking your production runs do — but often the only expedient is hand-stamping or interrupting production marking just for a small lot. This is exactly why Markem developed the little hand-fed, hand-operated "Companion" — as a *practical* combination of high quality imprinting and extremely low cost for short run marking.

Markem printing elements for the Companion include rubber plates, zinc etchings and slotted metal Masterplates with quick-change type inserts — to handle all sorts of marking requirements. You also have a choice of thousands of Markem specialty inks for these printing elements — air dry, baking or firing types . . . that "take" on everything from polyethylene to glass. The "Companion" itself costs $203.50. With your Companion, printing elements and inks, you can mark flat, curved or irregular shapes — either directly or by offset — with imprints up to 2" x 3". There's no extensive set-up, trial and error or special tricks of the trade — anyone can get good imprints with a Companion, *anywhere* in the plant.

In the meantime, your *production* run marking keeps right on — and this is where other, more specialized Markem machines can also help you. Some have automatic feed and ejection, others are designed to be built into your line or packaging equipment. There are now about 40 basic *groups* of these direct, offset and screen process marking machines, used for marking everything from baseball gloves to transistors. Find out how you can make *your* marking more profitable, with a "Companion" or some other combination of Markem machine, type and ink. Write Markem Machine Co., Keene 18, New Hampshire.

MARKEM

EVERYTHING INDUSTRY NEEDS . . . FOR PROFITABLE MARKING . . . SINCE 1911



finished with Swift's

ADCOTE

by Trowel • Brush • Spray

gives the

following advantages

CLEAN WHITE SURFACE
GOOD COLOR STABILITY
GOOD CHEMICAL & MOISTURE RESISTANCE
FIRE RETARDANT
RESISTS MOLD AND RODENTS
WASHABLE

It's not a plaster . . . not a paint. Swift's Adcote wall finish was especially developed to provide industrial users with a high moisture resistant finish that is easy to apply yet has good adhesion to many different surfaces and presents a clean, white, uniform appearance.

One trial is worth a thousand claims.

Possible Uses

Refinishing concrete surfaces
Imparting moisture resistance to concrete blocks
Resurfacing of brick walls
Finishing damp surfaces
Imparting moisture resistance to basement walls
Adhesive for the erection of ceramic tile
Finish for board-type insulation
Adhesive for board-type insulation

Swift 103 RD YEAR *To Serve Your Industry Better*

MAIL COUPON FOR FURTHER INFORMATION

Swift & Company
Adhesives Products Department
Chicago 9, Illinois

☐ Send descriptive bulletin
☐ Send information on trial order

Name _____

JUST CLIP TO LETTERHEAD AND MAIL

ADVERTISERS' LITERATURE

Begins on page 192

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

410—Benches. Catalog 204 (16 pages) gives complete data on 264 models of modern-flow benches. Equipto.

411—Slotted Angle. Free Ideas-In-Action Reports on how to solve building and framing problems. Acme Steel Co.

412—Abrasive Tread Plate. Application, design, fabricating data on non-slip tread plate. Aluminum Co. of America.

413—Pipe, Fittings. Catalog gives detailed information on plastic pipe and fittings. Colonial Plastics Mfg. Co.

414—Lighting Fixtures. Catalog OD-1036 on uniframe recessed incandescent lens box line. Daybrite Lighting.

Human Relations Help

If that's what you want, look at the list below. It's FACTORY's list of reprinted articles on human relations. Titles tell you the specific subject. Pick those you want, order them (by code number) from FACTORY Reader Service, 330 W. 42nd St., New York 36. Send cash, or ask us to bill you. (Quantity prices on request.)

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A185 Better Way to Measure Your Managers
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A209 A Brand-New Breakthrough in Management Development
A213 Shift Scheduling Made Easy

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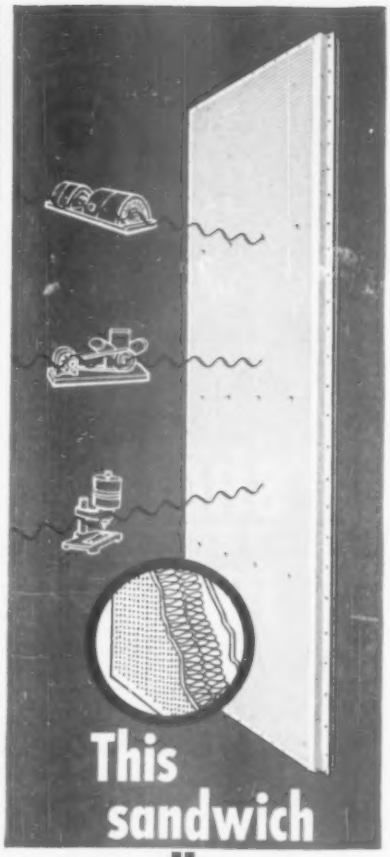
A67 The Foreman on His Job
A117 Forecast: More Women in More Jobs in More Plants
A126 Taking the Doubletalk Out of Communications
A138 Manpower Yardsticks
A144 Truth About the Older Worker
A153 Tips to Successful Discipline
A170 Handling the Problem Worker



swallows noise

This is an Eckoustic Panel — a very special sandwich, made of two layers of steel wrapped around a blanket of Fiberglas.

You can use it as a modular building block to build a soundproof room or plant office — a machinery enclosure — a production test facility — or, for that matter, practically anything where you must shut noise out, or seal it in.

Eckoustic panels protect employees from the harmful effects of exposure to continual noise . . . increase employee efficiency by creating more comfortable working conditions. And we have the results of acoustical studies which show they do it more effectively than other types of acoustical panels.

We also have a free folder that tells how Eckoustic Panels can help you solve sound control problems faster and more economically than you may have thought possible.

Let us send you the complete information without obligation.

Write:

THE **Eckel** CORPORATION

155 Fawcett Street, Cambridge 38, Mass.

Circle 563 on Reader Service Card

Circle 564 on Reader Service Card

BIG, NEW MONEY-SAVING
HUGE-HAUL

Doubles your payload, increases your profit!

30 cubic yards, 12 ton legal loads

Huge-Haul's detachable body carries more per trip, reduces the number and cost of trips to rubbish and refuse disposal point.

Fully hydraulic. Easy, fool-proof operation. Single lever controls all movements. Body automatically secured on truck by positive automatic locks.

You'll want to know all about this new profit builder! Send today for complete details and the name of your nearest Huge-Haul dealer.

HUGE HAUL ® BW BORG-WARNER

INGERSOLL KALAMAZOO DIVISION
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ANOTHER IN A SERIES
OF MOTOR FACTS
FROM ALL INDUSTRIES

Westinghouse Life-Line A motors helped save $13,500 in olive pitting operation . . .

at Bell Packing Corporation, Berkeley, California

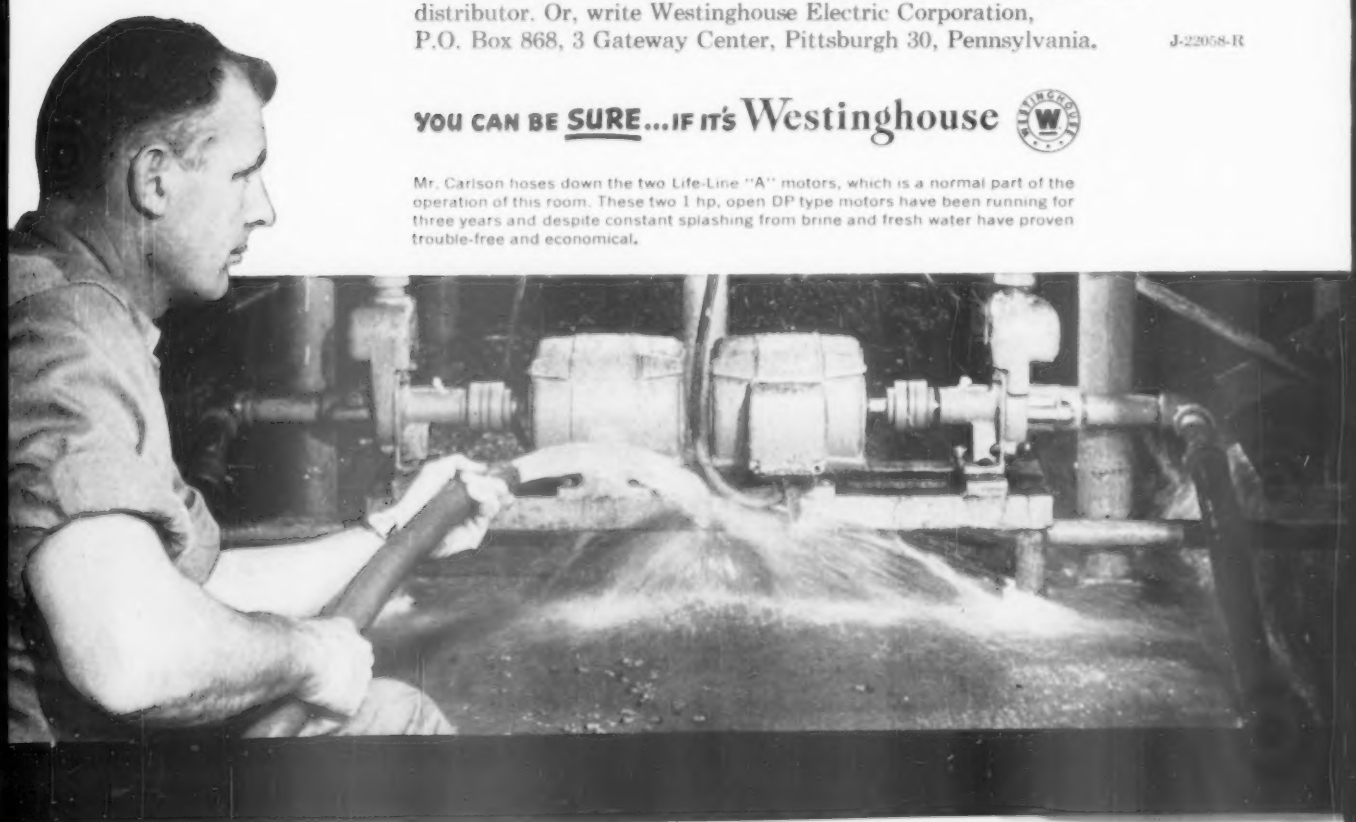
Continuously driving brine pumps for olive-pitting operation, Westinghouse motors have helped cut production costs, improved product quality

"Westinghouse Life-Line® 'A' motors make possible the profitable functioning of the new pitting room in our olive canning plant," states Mr. William Carlson, Plant Superintendent at Bell Packing Corporation, Berkeley, California.

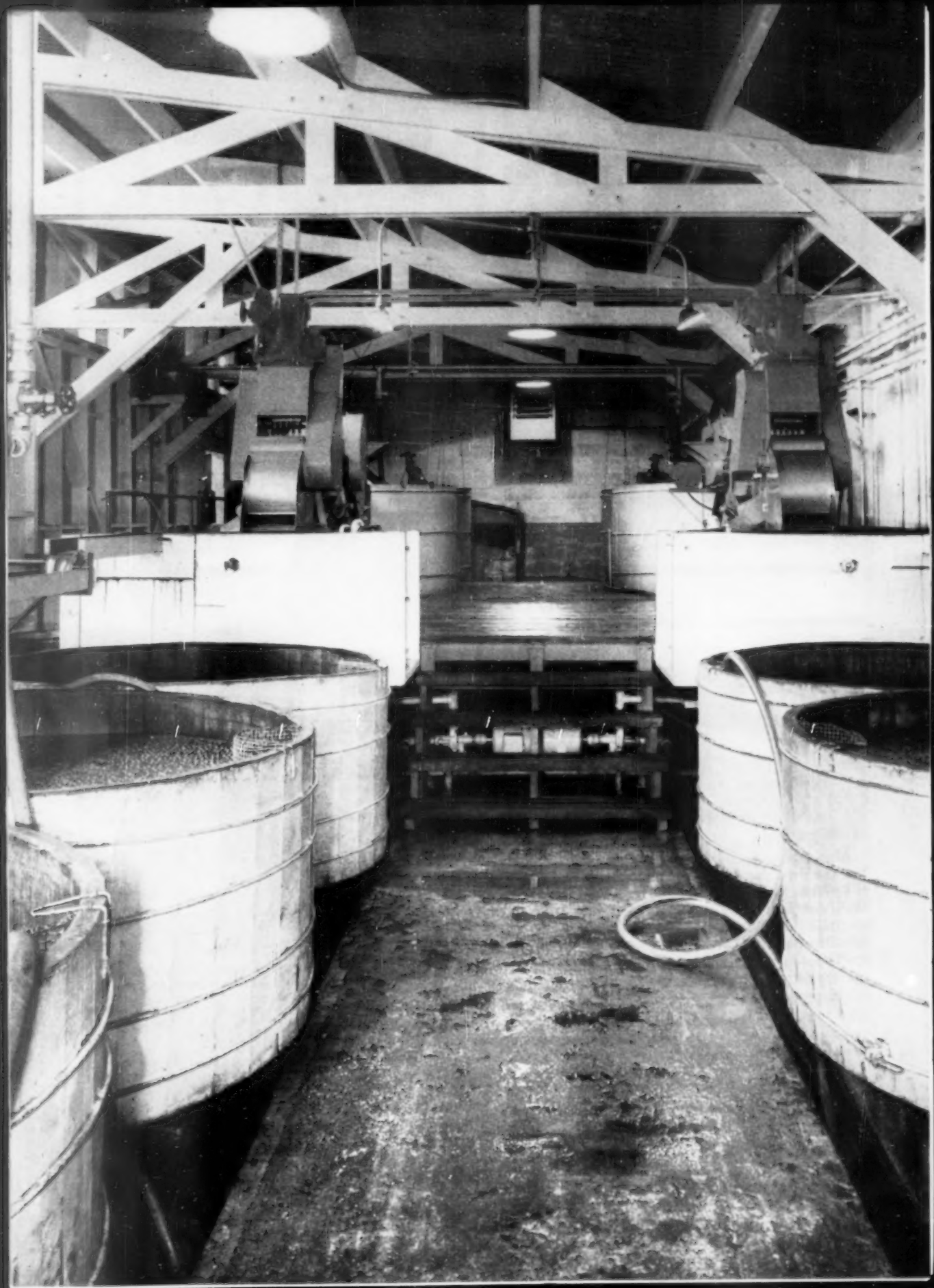
Mechanizing this operation has increased production 15% and released a good share of the normally required manpower for use elsewhere in the plant. In three years, Bell Packing reports a saving of $13,500. In designing the area, Bell Packing Corporation considered the choice of motors for the brine pumps the most serious problem. Westinghouse 1 hp Life-Line "A" motors were chosen on their record of long-term, trouble-free life under the toughest conditions.

POWER-UP with the motor designed to meet modern industry's needs. For complete information, call your Westinghouse sales engineer or distributor. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-22058-R

YOU CAN BE SURE...IF IT'S Westinghouse



Mr. Carlson hoses down the two Life-Line "A" motors, which is a normal part of the operation of this room. These two 1 hp, open DP type motors have been running for three years and despite constant splashing from brine and fresh water have proven trouble-free and economical.



YOU CAN'T BARGAIN WITH SAFETY

Wire Ropes may look alike... but it's performance that counts

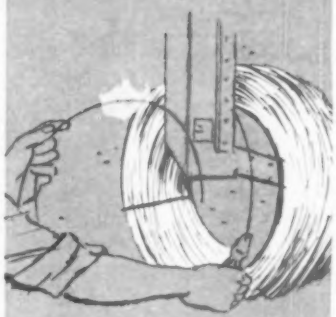
The Image of CF&I stands for the top performance records of all CF&I steel products. For instance, take one of these products—CF&I-Wickwire Rope.

Many brands of rope *look* alike but the rope you buy must pay off in *performance*, not *appearance*. With Wickwire Rope you get a number of quality factors that lead to outstanding performance. These factors are "built-in" the rope through many quality controls and tests. Since CF&I performs all steel producing, wire making and rope fabricating operations within its own plants, exacting control and testing procedures can be carried out and supervised at every step. Here is just one of these procedures:

Both-Ends Physical Tests

Samples are cut from both ends of every coil of wire and given complete physical tests — for tensile strength, roundness, torsion and uniformity of diameter. Coils that fail any test are rejected for such critical applications as wire rope.

We have recently printed several folders that discuss many more Wickwire control and testing procedures, plus wire rope recommendations for specific equipment. To get a copy, contact the nearest CF&I sales office—but please *state your industry or type of equipment.*



Both-ends testing of wire ensures safety and top performance in CF&I-Wickwire Rope.

WICKWIRE ROPE

THE COLORADO FUEL AND IRON CORPORATION 6958

In the West: **THE COLORADO FUEL AND IRON CORPORATION**—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso
Farmington (N. M.) • Fort Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Odessa (Tex.) • Oklahoma City • Phoenix
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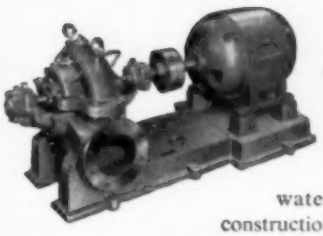
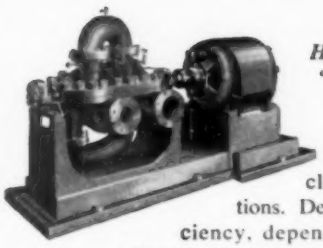
In the East: **WICKWIRE SPENCER STEEL DIVISION**—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans
New York • Philadelphia

CF&I STEEL

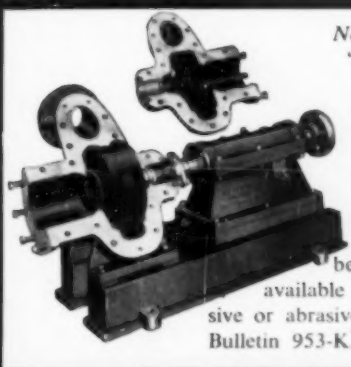
HOW MUCH WILL IT COST YOU



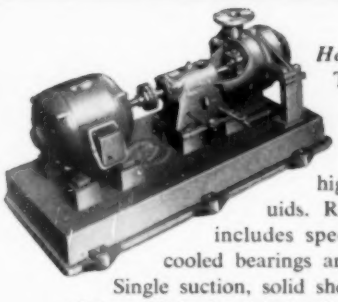
Clear Water Pumps: "Buffalo" Double Suction Pumps assure maximum efficiency in clear water service. Rugged construction provides long life with minimum maintenance. 10 to 14,000 gpm capacities. Write for Bulletin 955-R.



High Pressure Pumps: "Buffalo" Multi-Stage Pumps are ideal for boiler feed and other clear water applications. Designed for top efficiency, dependability, long life. These husky pumps operate against heads as high as 1500 ft., in capacities to 900 gpm. Write today for Bulletin 980-D.



Non-Clogging Pumps: "Buffalo" Diagonally Split-Shell Pumps are specially designed for moving high consistency liquids. Down-time, wear and wedging are reduced. Rubber-lined models are available for pumping corrosive or abrasive liquids. Write for Bulletin 953-K.



Heat Transfer Pumps: These special "Buffalo" pumps are engineered for handling high-temperature liquids. Rugged construction includes special alloys, water-cooled bearings and special packing. Single suction, solid shell design is highly efficient. Write for full details.

Chemical Liquid Pumps: These special "Buffalo" Pumps are engineered for severe service in handling most corrosive, abrasive or high consistency liquids. Ten special types are available in a variety of trim. Write for Bulletin 982-A.

NOT TO INSTALL "BUFFALO" PUMPS?

How "Buffalo" Pumps Can Save You Money Right Away: "Buffalo" offers a broad line of pumps. This means you can usually choose the right pump to fill almost every liquid-moving need. With "Buffalo" Pumps you pay only for the type, size and capacity required — no more. This often means substantially lower initial cost.

How "Buffalo" Pumps Can Save You Money Over the Years: "Buffalo" Pumps are engineered for peak hydraulic efficiency. This gives you consistently lower pumping costs. "Buffalo" Pumps are ruggedly built throughout. Extra heavy-duty components reduce maintenance costs over a longer productive life span. "Buffalo" Pumps are designed for quick, easy access to inner parts. Thus routine maintenance costs are lower. "Buffalo" Pumps feature parts interchangeability. This means further savings in reduced parts inventories.

Your nearby "Buffalo" Engineering Representative will be glad to help you choose the pumps that will most economically fill your needs. Phone him today, or write us direct.

"Buffalo" PUMPS

BUFFALO PUMPS
Division of Buffalo Forge Co.
471 Broadway Buffalo, N. Y.

Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

a modern installation starts with proper systems

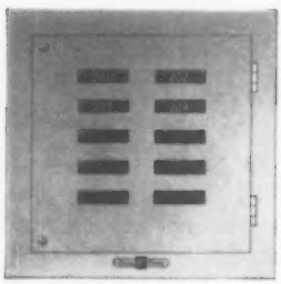
FOR PLANT CONTROL · COMMUNICATION · PROTECTION

When you modernize or expand your plant's facilities, remember that modern signaling systems can benefit plant operation in 2 important areas: greater safety to life and property, and increased efficiency and productivity. Industrial systems, designed and manufactured by Edwards, include automatic and manual fire alarm systems—coded personnel paging—synchronous clock systems—program scheduling—alarm and process control annunciators—and a full range of audible signals and communications equipment. The Edwards Technical Representative and your local Edwards Distributor salesman will be glad to survey your particular plant signaling needs. There is no obligation for this service.

HERE'S A CASE HISTORY EXAMPLE OF HOW THIS TEAM WORKING WITH THE ARCHITECTS SOLVED AN UNUSUAL SIGNALING PROBLEM.

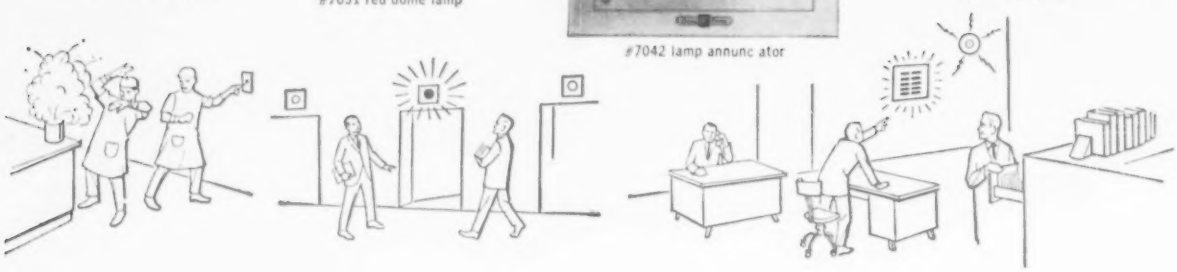
#7603 alarm button

#7031 red dome lamp



#7042 lamp annunc ator

#340 warning bell



THE PROBLEM: to design an easily activated employee alarm system to protect laboratory technicians at National Dairy Products Corporation's new research and development center in Glenview, Illinois, designed by Childs & Smith of Chicago, Ill. THE SOLUTION FROM EDWARDS: (1)—a lamp annunciator installed at a central location, showing alarm zones by floors. (2)—red dome lamps mounted over each of 152 workroom entrances. (3)—over 300 alarm buttons, two installed in each room.

OPERATION: should an accident occur, the employee has two choices. (1)—enter his individual shower, turn the shower handle, thereby lighting the red dome lamp over his doorway, and flashing a zone indication on the central annunciator while an adjacent alarm bell rings; (2)—push either wall-mounted alarm button, thereby setting off the same system.

Technical literature and "The Edwards Signal Log" (specifically designed for your use) may be obtained by writing Dept. FM-12, Edwards Company, Inc., Norwalk, Conn. In Canada: Edwards of Canada, Ltd, Owen Sound, Ont.

EDWARDS

SPECIALISTS IN SIGNALING SINCE 1872

Control
Communication
Protection

During processing, Anaconda Butyl passes through screens similar to this one—screens fine enough to hold water—fine enough to trap any undispersed particle which might cause future insulation trouble in high-voltage cable.

HOW AN ANACONDA PROCESS HELPS SCREEN OUT SERVICE FAILURE IN HIGH-VOLTAGE CABLE

Even butyl—the most effective rubber insulating material ever developed for high-voltage cable—requires additives to bring out all its superb insulating properties. These additives are usually in the form of finely divided powders which are extremely difficult to disperse uniformly in the raw butyl.

And actual service proves poor dispersion can drastically shorten high-voltage cable life.

That's why Anaconda developed an entirely new mixing process. And why Anaconda built screens (like the one you see above) into the production line to catch every oversized undispersed particle. These screens are so fine, they will actually hold water.

Yet tons of butyl insulating compound are squeezed through before the screens need cleaning, a tribute to the new mixing process. And—to the rigorous quality control which dominates every specialized step in the manufacture of Anaconda Butyl (AB) Cable.

This highly specialized quality control is probably the biggest single reason why Anaconda Butyl (AB) Cable gives such long trouble-free life. Why you should consider it the next time you buy high-voltage cable. Send for Publication DM 5903: High-Voltage Durasheath* Cable to Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. 10258

ASK THE MAN FROM

ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

For more facts Circle 570 on Reader Service Card

MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

Jantzen tries "new kind" of caster... eliminates 98% of wheel replacements

Maintenance and materials handling men at Jantzen, Inc., manufacturers of beach and sportswear in Portland, Oregon, have solved a handling problem common to many concerns with buildings spread out over a sizeable area.

They did it by putting Bassick Floating Hub casters on transport trucks towed in trains of two to six units by power trucks for inter-building service.

Almost immediately, trucks equipped with Floating Hub casters stopped showing up on maintenance and replacement records. After five years of continuous service only 3 out of more than 160 Floating Hub casters have had to be replaced. Standard caster previously used had required replacement after 6 to 8 months.

Truck trains move at up to 15 mph over rough asphalt roadways. With Bassick Floating Hub casters, however, casters last longer, and wear and tear on trucks and roadways is greatly lessened.

Floating Hub casters on power-pulled trucks got trial run 5 years ago . . . are still going strong at Jantzen, Inc. Life of caster used previously: 6-8 months.

Behind this dramatic product, Jantzen beachwear, is an almost equally dramatic story of materials handling: caster replacement cut 98%.

Fragile Product—No! Shock Absorbing Caster—Yes!

Many companies handling materials which are not delicate, fragile nor breakable are turning to Bassick Floating Hub casters. Why? Shock absorbing construction equips these casters for extremely rough service in power pulled applications. As a result, maintenance and replacement of casters, trucks, floors or roadways is drastically reduced.

Case Hardened Casters

At Bassick 6 heat treating furnaces, other modern equipment, housed in a special department, handle approximately 5,000,000 pounds of heat treated work per year. Ball races and other parts of Bassick casters are case hardened to increase life under heavy loads, prevent wear in ball bearings. One more reason Bassick casters roll longer.

Another Caster for Minimum Maintenance

Bassick Grooved wheel casters operating on inverted angle iron tracks require minimum maintenance provide maximum efficiency. Wherever materials must move often over same route, consider an inexpensive track set up and Bassick Grooved Wheel casters. Grooved Wheel casters operate both on and off tracks—provide positive control of loads.

Where to Call

A local Bassick distributor is able and willing to help you. Call him in when you need casters and wheels. 9.39

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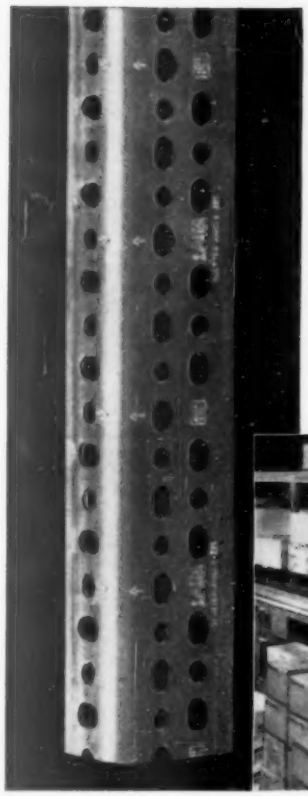

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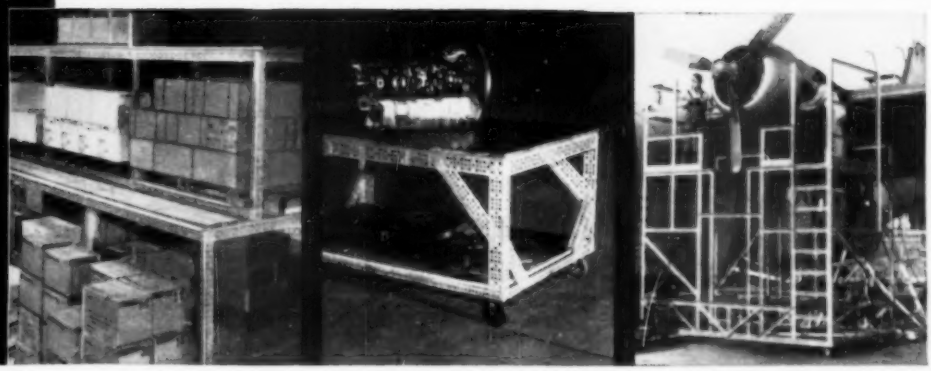

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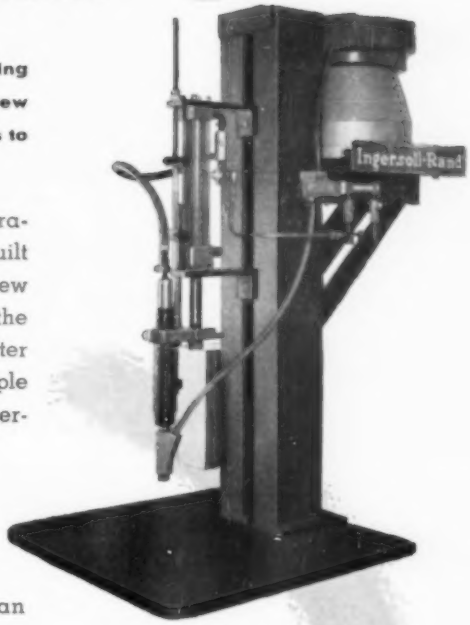


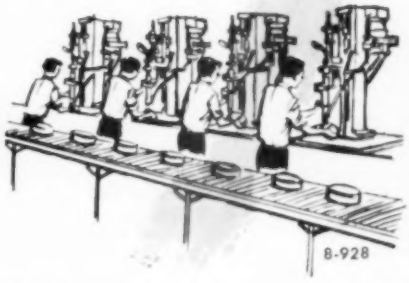
dividends on payroll dollars

Using the new R.A.F. Screw Driver, one man can outperform a half dozen operators using conventional hand held screw drivers. As an example of savings possible with Rapid Automatic Fastening, multiply the yearly wage you pay one operator by the number of operators the R.A.F. Screw Driver replaces. This figure, minus the cost of the R.A.F. Screw Driver, represents your Dividend on Payroll Dollars for the first year alone.

For the full story on Dividend Dollars with Rapid Automatic Fastening, call your local Ingersoll-Rand office today, or write for Bulletin 5266.

✶ in small shops

✶ on assembly lines



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Tools plus AIRengineering increase output per man

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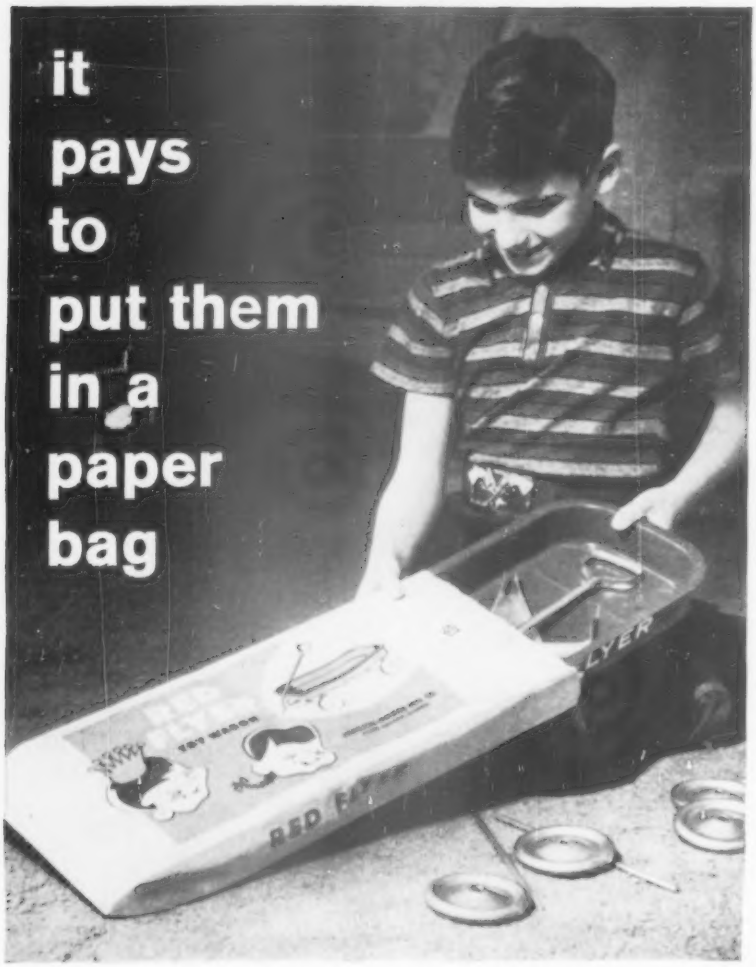
when you pack "knock-downs" for

HOME ASSEMBLY



Compact, convenient paper bags make excellent security agents for packaged home-assembly products. They speed packing, help lower shipping and handling costs, conserve valuable warehouse and shelf space.

Take the toy wagon bag, above. It packs 22 put-'em-together metal parts. Bag replaces carton, is lighter, less expensive. Colorful printing serves as economical advertising for brand name and contents.

Write for free Booklet CP-1 today. It illustrates dozens of different ways paper bags are helping manufacturers save money, both inside the plant and out.

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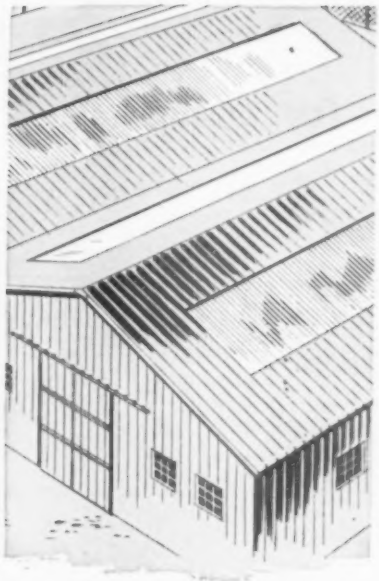

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Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Exide-Ironclad-powered electric industrial truck loads pallets of Listerine into highway van at Lambert-Hudnut Mfg. Labs, Lititz, Pa.

HOW TO BUY ELECTRICS WHEN MONEY'S TIGHT... LEASE BATTERIES AND CHARGERS FROM EXIDE

When Lambert-Hudnut Mfg. Labs built its new plant in Lititz, Pa., it wanted industrial trucks with battery power . . . for economy, cleanliness and freedom from fumes. But money was needed for other capital equipment too. How could Lambert-Hudnut stretch its dollars?

Exide's lease plan provided the answer. For an initial 6-truck fleet, Exide supplied complete battery and charging equipment on a lease basis. No capital investment was required. Since then the company has added three more trucks . . . again leasing batteries from Exide.

You too can use this plan to reduce the capital outlay on electric industrial trucks. Choose from two leasing plans: uniform monthly payments where payments are equal for the period of the lease; or accelerated monthly payments where higher payments over the first few years mean reduced payments later. You can also negotiate a purchase option with either plan.

For more details on leasing or buying Exide-Ironclad batteries and chargers, write for Bulletins #5671 and #6230

Today's best value in an industrial battery. 50 years ago, Exide patented the Exide-Ironclad tubular positive plate battery. Today it is still unmatched for power life and economy. Latest improvements boosted power 25% to 44% in the same size . . . with even longer life potential.

EXIDE CHARGERS PROTECT BATTERY LIFE

The new vertical Exide chargers are specially designed for industrial truck use. Available in a full range of ratings to meet the requirements of all trucks. Taper charge and automatic shutoff protect battery from overcharging . . . insure longest possible life. Vertical design saves two-thirds in floor space required. Down draft cooling keeps dirt accumulation to a minimum. Easy to maintain.

Regular Exide service covers both batteries and chargers. Write for new brochure #6259 giving complete information.

Exide®

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Get Lasting Protection Against Slipping With Alcoa Abrasive Tread Plate

Injury no longer travels this ramp. Keeping it at bay is Alcoa® Aluminum Abrasive Tread Plate with its hard, abrasive surface that remains slip-proof even when wet, oily or greasy. It is made with tough particles of fused aluminum oxide and is the only nonskid floor plate that gives all the advantages of lightweight, corrosion-resistant aluminum. Because wear only serves to renew the surface by uncovering abrasive particles imbedded below the original level, it offers lasting protection against slipping accidents that can injure skilled workers, cause expensive production breakdowns and increase insurance rates.

Find out how you can reduce accidents by installing easy-to-handle Alcoa Abrasive Tread Plate in aisles, ramps, catwalks and other areas where slippery deposits accumulate. For more information, check the coupon below, write Aluminum Company of America, 1687-M Alcoa Building, Pittsburgh 19, Pa., or call your nearest Alcoa Distributor.

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Show me how Alcoa Abrasive Tread Plate prevents slipping. Please send a FREE sample—also application, design and fabricating data.

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designed to collect dust from single machines

portable— easily installed

DUSTKOP STOPS DUST

Self-contained Dustkop models, like the "520," are practical and effective in collecting dust from single machines. They're designed specifically for service with surface grinders, tool and cutter grinders, offhand grinders, buffers and other small wheel equipment. These units are also easy to install — are actually portable — and very economical to operate.

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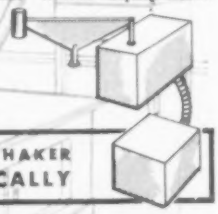

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CROWN CONTROLS CO. INC.

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NO SUPPLEMENTARY LIGHTING—Here inside the new wing of Assembly Products, Inc., the Power Groove general lighting does all the work—without supplementary lighting—improving appearance and efficiency, reducing initial cost and operating expense.

"Our new building cost us 50¢ a square foot less—just by using new General Electric Power Groove Lamps!"

says Mr. John D. Saint-Amour, President, Assembly Products, Inc., Chesterland, Ohio

When Assembly Products, Inc., an aggressive and growing manufacturer of meter-relays, added a new wing to its plant in Chesterland, Ohio, it quickly settled on new General Electric Power Groove Lamps. Why Power Grooves? Because they got more light per lamp—so they needed fewer lamps and fixtures. They got a comfortable 250-footcandles on the work, *and saved 50¢ a square foot over the next most powerful fluorescent lamp type.*

In a recent letter to General Electric, Mr. John D. Saint-Amour, president of Assembly Products, said: "The Power Groove system recently installed in the new wing of our plant has already proved to be a valuable investment. In the older plant area, both general lighting and supplementary lighting were required. The general lighting *alone* is all that's needed in our new wing. We're confident this new lighting system will result in better, faster, and more efficient production."

PLANNING NEW LIGHTING? Then find out all about the *new* G-E Power Groove Lamps. They come in 4, 6 and 8-foot lengths—designed to deliver up to 15,000 lumens, and they're interchangeable with original Power Grooves. For more information, write: General Electric Co., Large Lamp Dept. C-938, Nela Park, Cleveland 12, Ohio.

SAVINGS ON INITIAL INVESTMENT BY USING G-E POWER GROOVES COMPARED TO OTHER 8-FOOT FLUORESCENTS

(Based on a 250-footcandle level, at about $2.06 per square foot using Power Grooves)	SAVINGS PER FOOT	SAVINGS PER 10,000 FT.
POWER GROOVES vs. 8′ HIGH OUTPUT LAMPS (at $2.56/sq.ft.)	50¢	$5,000
POWER GROOVES vs. 8′ SLIMLINE LAMPS (at $2.83/sq.ft.)	77¢	$7,700

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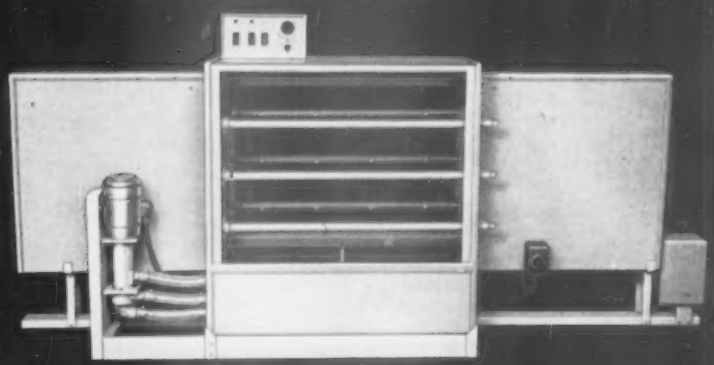
Unique Fabrication Shows Versatility of VAN-COR PVC



Production Etcher for Printed Circuits, made by Centre Circuits, Inc., State College, Pa.

To resist acid corrosion, this etcher is primarily made of Van-Cor PVC pipe, fittings, (standard and specially machined), valves, sheet (transparent and regular), and joining strips.

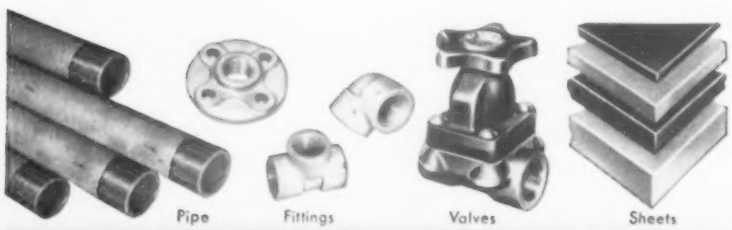
HOW CAN VAN-COR SERVE YOU?

Van-Cor PVC has many applications for plant use, or in your end product. It is ideal for plating equipment, filters, flux spray booths, chemical treatments, bleaching operations, glass polishing, and corrosive fume handling in general.

ADVANTAGES OF VAN-COR

1. Resists Corrosion of Industrial Acids & Alkalies
2. Light in Weight (½ that of Aluminum)
3. Easily Installed; High Tensile Strength; Low Flow Resistance
4. Readily Formed, Machined, Threaded and Welded

Write for Catalog and Name of Nearest Distributor



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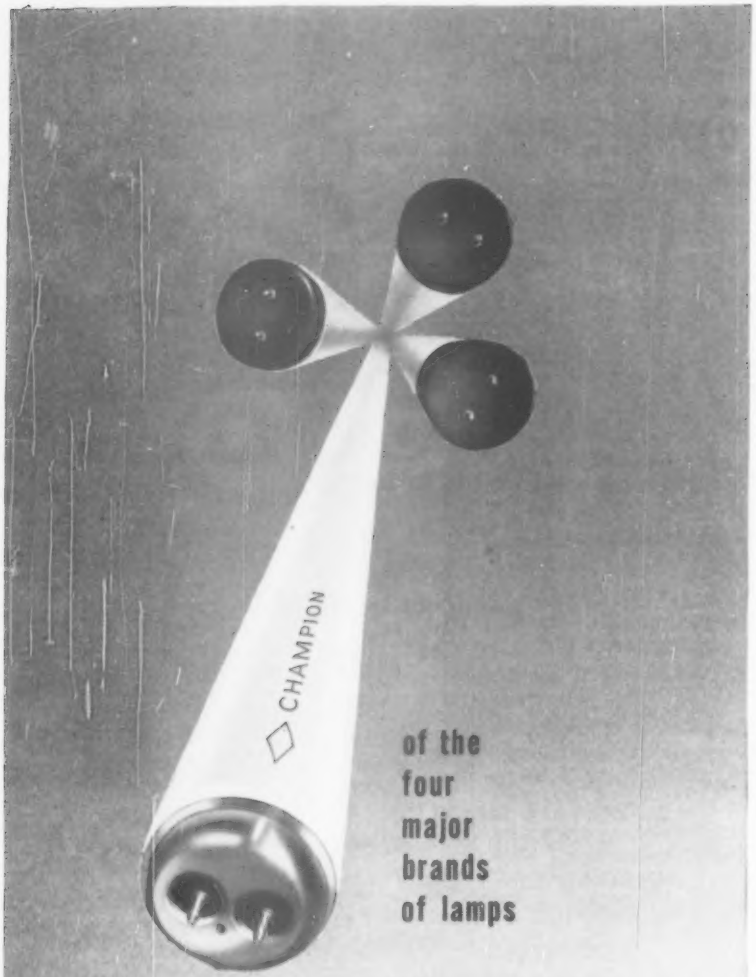

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CHAMPION LAMP WORKS, Lynn, Massachusetts

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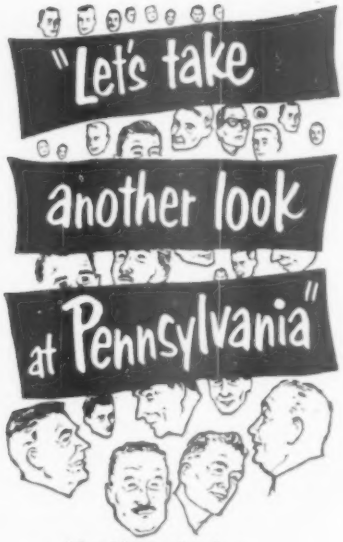

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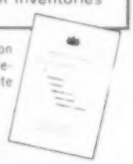

Pennsylvania Department of Commerce

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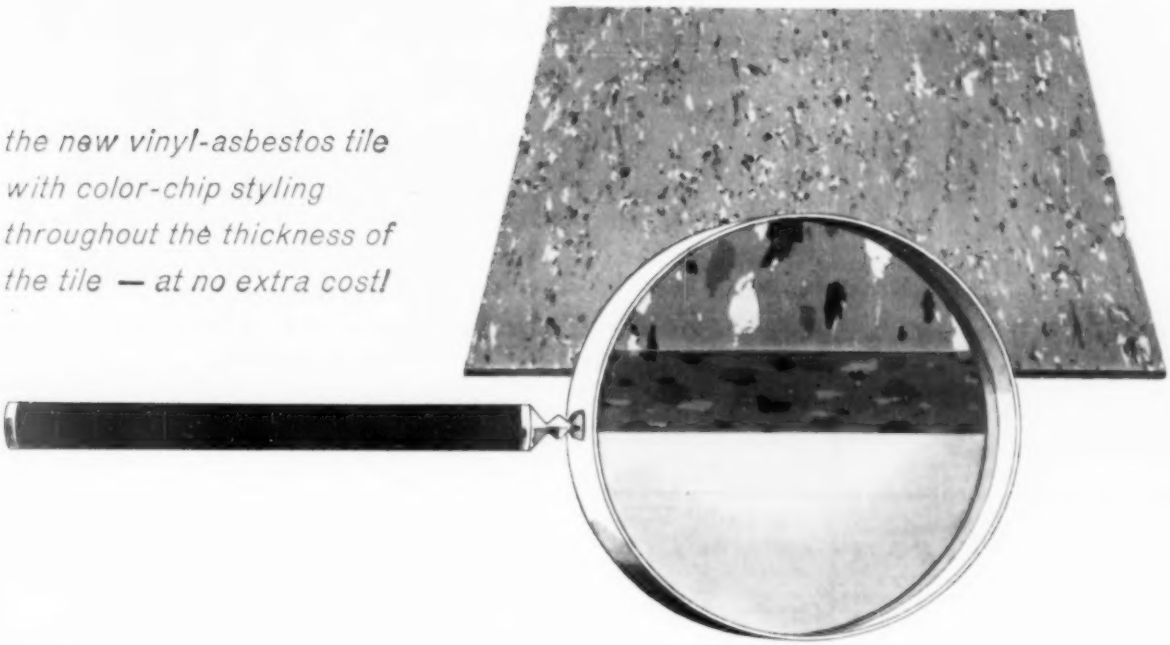
presenting **Vina-Lux® 800 Series**

HEAVY-DUTY ARCHITECTURAL PATTERNS

the new vinyl-asbestos tile with color-chip styling throughout the thickness of the tile — at no extra cost!



PERMANENT BEAUTY — EVEN IN PROBLEM FLOOR AREAS! Vina-Lux 800 Series is the ideal answer to the constant wear and tear of heavy foot traffic because the color chips are distributed throughout the full thickness of the tile — from top to bottom. It combines artistic beauty with rugged durability.

LONGER WEAR — LOWER MAINTENANCE COST! Vina-Lux 800 Series is denser, more closely textured, more resilient. Superior construction resists indentation, dirt and grime, is unaffected by grease, alkali and common chemicals — gives a new degree of comfort and safety underfoot.

SIX DISTINCTIVE COLORS! Vina-Lux 800 Series offers a distinctive selection of decorative colors — including beiges, greys, green and white — that solve the most exacting requirements in decor and light reflectance.

COSTS NO MORE! Despite its many new features and outstanding advantages the Vina-Lux 800 Series costs no more than ordinary vinyl asbestos tile. Complete information, samples and color charts are yours without obligation.

AZROCK FLOOR PRODUCTS DIVISION
UVALDE ROCK ASPHALT CO. • FROST BANK BLDG. • SAN ANTONIO, TEX.

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now in effect

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Your Bonds help provide this money—help America keep the peace. So, to build a brighter future for yourself and your family—and to *protect* it—save with U.S. Savings Bonds. They're better than ever.

HELP STRENGTHEN AMERICA'S PEACE POWER

SAVE WITH U.S. SAVINGS BONDS

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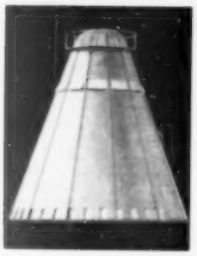

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(Classified Advertising)

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One of our clients has an opening for an individual qualified to take charge of this newly organized function.

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A progressive rapidly expanding manufacturer in the field of xerography (a method of physical photography based on solid state and electrostatic phenomena) has outstanding opportunities for:

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PROJECT ENGINEERS—M.E., or E.E. with 6-8 years of experience. Will be responsible for all phases of manufacturing engineering including a familiarity with engineering design methods, tools and economical manufacturing processes. Also will direct the activities of other technical people.

PROCESS ENGINEER—M.E. with 5 years experience in machine tools and processes. Will investigate new manufacturing processes and equipment, prepare recommendations for the purchases of machine tools, and aid in developing tool engineering standards.

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TIME STUDY ENGINEERS—1-3 years time study and standards experience in assembly operations. Time study experience in woodworking also helpful.

Kindly send resume and salary requirements to

FRED A. WETERRINGS
Industrial Relations Division
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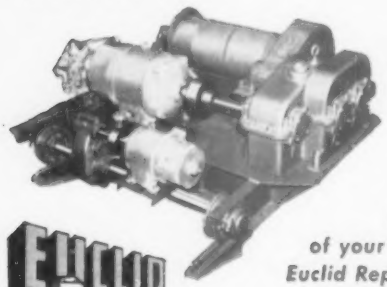
6 HALOID STREET
ROCHESTER 3, NEW YORK

"Bridge" the cost gap with a NEW EUCLID TROLLEY on your PRESENT CRANE BRIDGE!

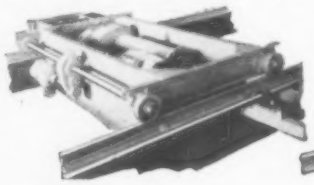
If your present overhead crane facilities require attention, it may be wise to investigate the possibilities of a crane remodeling job with new Euclid trolleys; available in a range of designs and capacities.

We can specifically cite instances where this plan has been employed to the complete satisfaction of the crane owners.

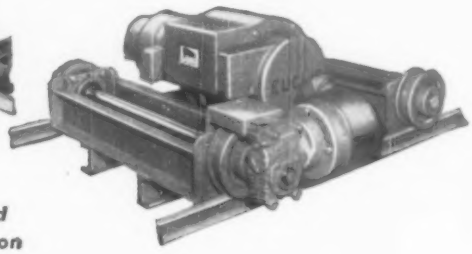
This Heavy Duty Series "M" trolley incorporates a three reduction spur gear hoist. Recommended for use on cranes subjected to continuous operation in the handling of heavier loads.



This submerged crane trolley is designed to meet the low headroom conditions which are more prevalent in existing low buildings today with the wide use of air conditioning in many industrial plants.



A Series "H" top running trolley with a worm gear drive used in double girder cranes in capacities of 3 to 15 tons.



REQUEST A SURVEY
of your present crane by a Qualified Euclid Representative without obligation
write for the CRANE CATALOG

THE EUCLID CRANE & HOIST CO. 1361 Chardon Rd. Cleveland 17, Ohio

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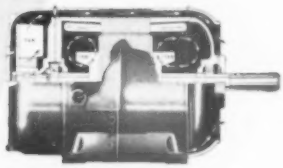

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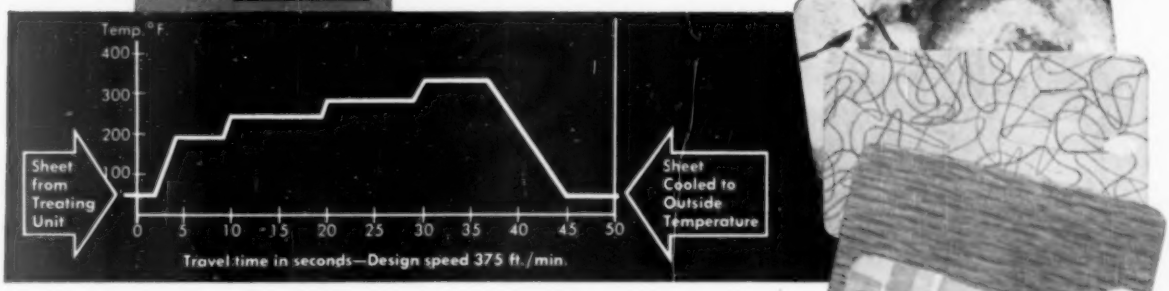
ROSS Air Systems

Engineered Atmospheres for Better Processing



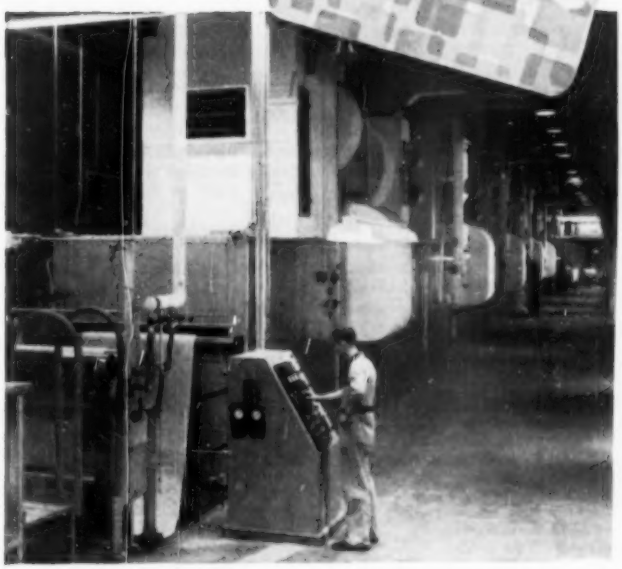
These Temperature Zone PLATEAUS are Critically Important

FORMICA® laminated plastic...long a 'byword' when modernized kitchens are discussed...starts with heavy kraft paper, called Core Stock. But this paper first must be treated properly and then advanced in the oven to insure proper behavior in the final curing process to assure the quality and the durability of the finished products.

The curing of this Core Stock takes place in a large special oven designed and constructed by Ross Engineers. But what takes this operation out of the class of just a routine enclosure with hot air passing through and what puts it definitely in the class of an 'Engineered Atmosphere' is the precise zoning, precise temperature control, and precise circulation of heated air...three steps in the conditioning of the fast moving sheet.

Treated first with phenol-formaldehyde, the kraft paper then passes at a design speed of 375 ft. per minute through a 250 ft. oven (five heating zones and curing plus cooling section) thus heating from 200° F. stepping up to 350° followed by rapid cooling to outside temperature levels. Many engineering problems ...chemical, mechanical, thermal, electrical, instrumentation were involved in the design. All had to be carefully worked out and then integrated to make it a smooth, fast-working, efficient unit.

Further evidence of the broad experience of Ross Engineers in the specialized field of 'Engineered Atmospheres' can be found in the same plant...in the eight Ross Melamine Curing Ovens which prepare the top design sheet and transfer sheet prior to assembling



with the Core Stock. Within these eight ovens, as within the Core Oven, the carefully created 'Engineered Atmosphere' is the heart of the process.

Ross Engineers will be glad to discuss with any company its production problem involving heating, drying, curing, baking, paint finishing, humidifying, treating or otherwise conditioning materials and of related comfort air conditioning and ventilating where an 'Engineered Atmosphere' is the key operating step.

J. O. ROSS ENGINEERING

Division of Midland-Ross Corporation

730 Third Avenue, New York 17, N. Y.

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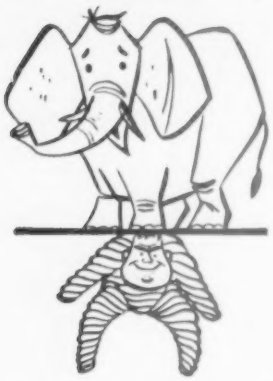
Tuffy Tips —on safe use of Slings and Hoist Lines

How Much Lifting Should be Done by Muscles?



Individual differences between workers make this a hard question to answer categorically. For a rule of thumb: the United States Department of Labor recommends men should handle no more than 50 pounds; women no more than 25 pounds. Of course, this is for men and women of average size and weight, in normally good physical condition. To remove all doubt, mechanical lifting and hoisting equipment should be used for all loads not comfortably lifted by muscles.

Rules to Remember For Wire Rope Safety

1. **BREAK IN** new wire rope with care. Don't use it at maximum load capacity until it is broken in beyond a doubt.
2. **OBSERVE SAFETY FACTORS.** Usually the rated load factor is 4 to 5. The Wire Rope Technical Board says 5. Elevators require 10. Static ropes — not hoisting, dragging or actively operating —may have a rated load factor of 3.
3. **LUBRICATION IS IMPORTANT** for safety, as well as for pliability and friction-fighting. Rust makes ropes brittle, and likely to break without warning. Thorough lubrication keeps out rust.
4. **INSPECT ROPES** and slings frequently for signs of serious wear. Careful inspection may save costly work stoppage or serious injury.

Sling Fittings Are Important Safety Aids

Proper fittings serve the dual purpose of greater safety and longer sling life. Fittings used on Tuffy Slings are made in more than a score of types, for every kind of service. Two of them are shown here:

(1) **EYE HOOKS:** Fittings for Tuffy Slings are selected on the basis of providing the complete unit assembly with equal breaking strength overall. Eye hooks are forged steel, weldless and designed for efficiency.

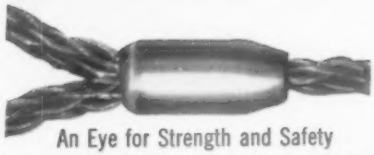
(2) **NEWCO SAFETY HOOK:** People can forget to lock a hook gate. This safety hook always remembers. A load cannot be lifted without the gate (yoke) automatically locking. To be opened, it must be manually pressed against a compression spring. We also supply this safety hook with a swivel eye for the sling. The name: Newco Safety Swivel Hook.

Tuffy Hoist Line: Stalwart Companion of Tuffy Slings

Tuffy Slings and Hoist Lines work as an efficient team on all types of overhead cranes, derricks and clamshells. Like all Tuffy Special Purpose Wire Ropes, Tuffy Hoist Line has the

right combination of strength, flexibility and toughness for greatest safety and longest service life. Use this Tuffy "team" to cut hoisting costs in every type of materials handling.

Your Tuffy Distributor Offers the Most in Service and Savings



An Eye for Strength and Safety

Slipped over the tuck-splice of the sling eye, and pressed on under tremendous hydraulic pressure, the steel ferrule holds so tight that it gives the eye splice full strength of the fabric. What's more, it is smoothly tapered to meet the main body of the sling. No abrupt edges or rough projections to injure hands and slow down work. The extra life, efficiency and safety of Tuffy's pressed-on ferrule is yours at no extra cost.

Tuffy Leads with Two Lives

"Tuffy Slings give us double the service life of ordinary slings." So reported one of the big steel corporations. The secret of Tuffy's extra life: the patented 9-part machine-braided fabric. It provides a combination of flexibility and strength never possible with ordinary wire rope.

Tuffy Takes the Danger Out of Kinks

In the first place, Tuffy Slings are not likely to kink at all. Try to kink a Tuffy. Even if you succeed with the aid of a vise, the kink can be easily straightened out with no material damage. Tuffy's machine-braided fabric won't take a "set" or deformity under the toughest of ordinary working conditions. So the danger of rope-weakening kinks is eliminated.

FREE! New Tuffy Sling Handbook

Revised and enlarged edition of famous sling manual. Covers all the bases in selection and use of Tuffy Slings and sling fittings. Gives types, dimensions, weights and rated loads. Even includes safety-approved standard signals used in operation of various equipment. Send for your free copy now. Write **Union Wire Rope Corporation, 2234 Manchester Ave., Kansas City 26, Mo.**

. . . Specialists in high-carbon wire, wire rope, braided wire fabric and stress relieved wire and strand.

UNION Wire Rope

S1

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F. J. Eberle, Business Mgr.

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CORRUGATED ASBESTOS TRANSITE®

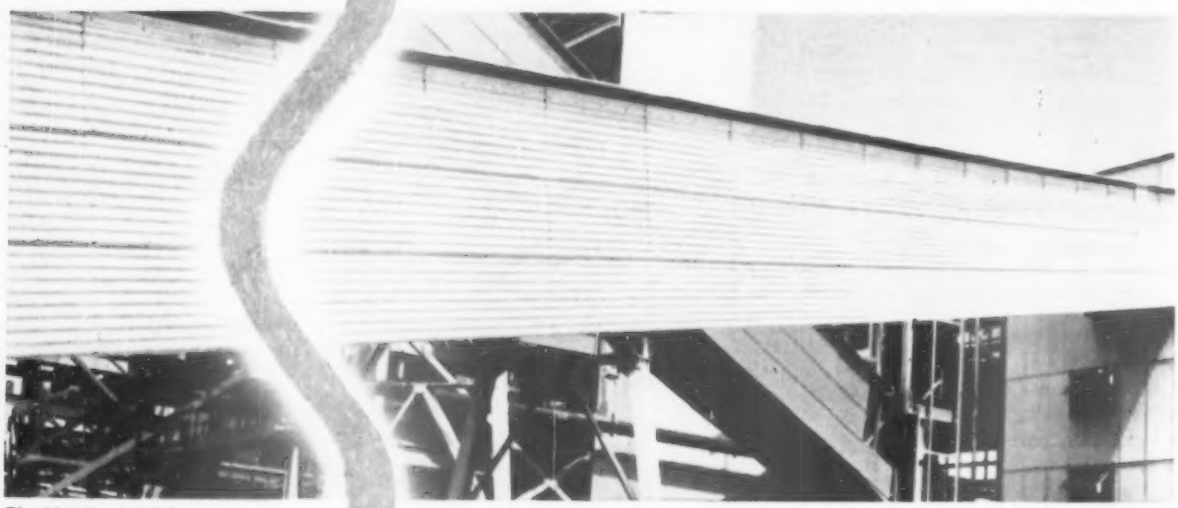
Corrugated Transite adds a modern decorative, eye-catching touch.

Corrugated Transite provides ages of service with virtually no maintenance.

Take asbestos; take cement. Form these virtually indestructible materials into carefully designed corrugated sheets, and you have Johns-Manville Corrugated Transite that wears like stone. It can't burn, can't rot, can't rust—and requires practically no maintenance.

Corrugated Transite is a neutral stone-gray color. It is attractive used alone or it harmonizes well with other materials. It is a structurally strong sheet for industrial construction or for commercial and institutional building. Also, it is often used decoratively for interiors.

Sheets of Corrugated Transite are 42" wide (10 corrugations) in lengths up to 12'—cover big areas quickly with minimum framing. For full information on this versatile material, send for the free 32-page brochure, "Corrugated Asbestos Transite." Write to Johns-Manville, Box 158, New York 16, N.Y. In Canada, Port Credit, Ont.



The big sheets of Corrugated Transite can be erected either horizontally or vertically.

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(See Page 167)

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Richmond....Monger Transfer & Stg. Co.
South Bend....Inland Chemical Co.

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Cedar Rapids....American Transfer & Stg. Co.
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Marshalltown....American Transfer & Stg. Co.

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Louisville (3)....The Globe Chemical Co., Inc.

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New Orleans (1)....Oliver H. Van Horn Co., Inc.

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Detroit (16)....Frederic B. Stevens, Inc.
Detroit (11)....The Udylite Co.
Ferndale....Gage Products Co.
Flint....Merchants & Mfgrs. Whse. Co.
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(See Page 160)

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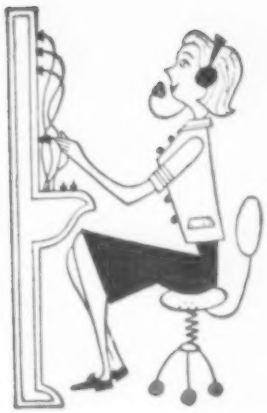

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7 Load Control Systems
8 Safety Switches
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15 Fork Lift Trucks
16 Storage Rack
17 Conveyor Equipment
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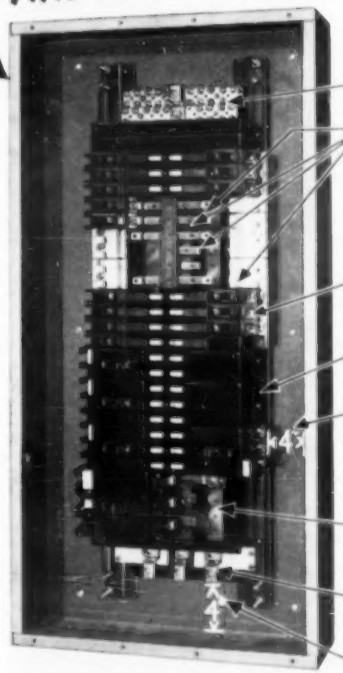
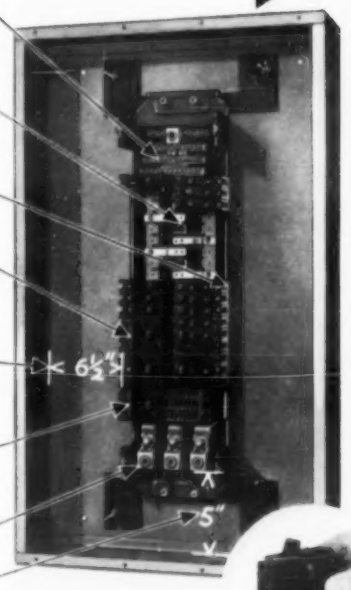
This is what you've been using

This is what Square D's New NQOB Gives You*



Binder-head Screw Neutral Taps	Box-type Neutral Lugs
Large Number of Parts Required for Additions and Replacements	Simplified Breaker Connection— One Screw All Joints Plated Bussing Like Wiring Diagram You Can See What Phase You're Connected To
Screw Terminals on Branch Circuit Breakers	Box Lugs on All Circuit Breakers
Unable to Mount One and Two Pole Breakers Opposite Three Poles	One and Two Pole Breaker May Mount Opposite Three Poles
Cramped Side Gutters	20"-wide Box Provides Roomy Side Gutters and Plenty of Room for Conduit in End Wall
Special Installation Required for 100 Amp Frame Breakers	100 Amp Frame Breaker May Replace Two 50 Amp Frame Breakers
Lugs for Copper Conductors Only	Lugs for Either Copper or Aluminum UL Approved
Minimum End Gutters	Full 5" End Gutters



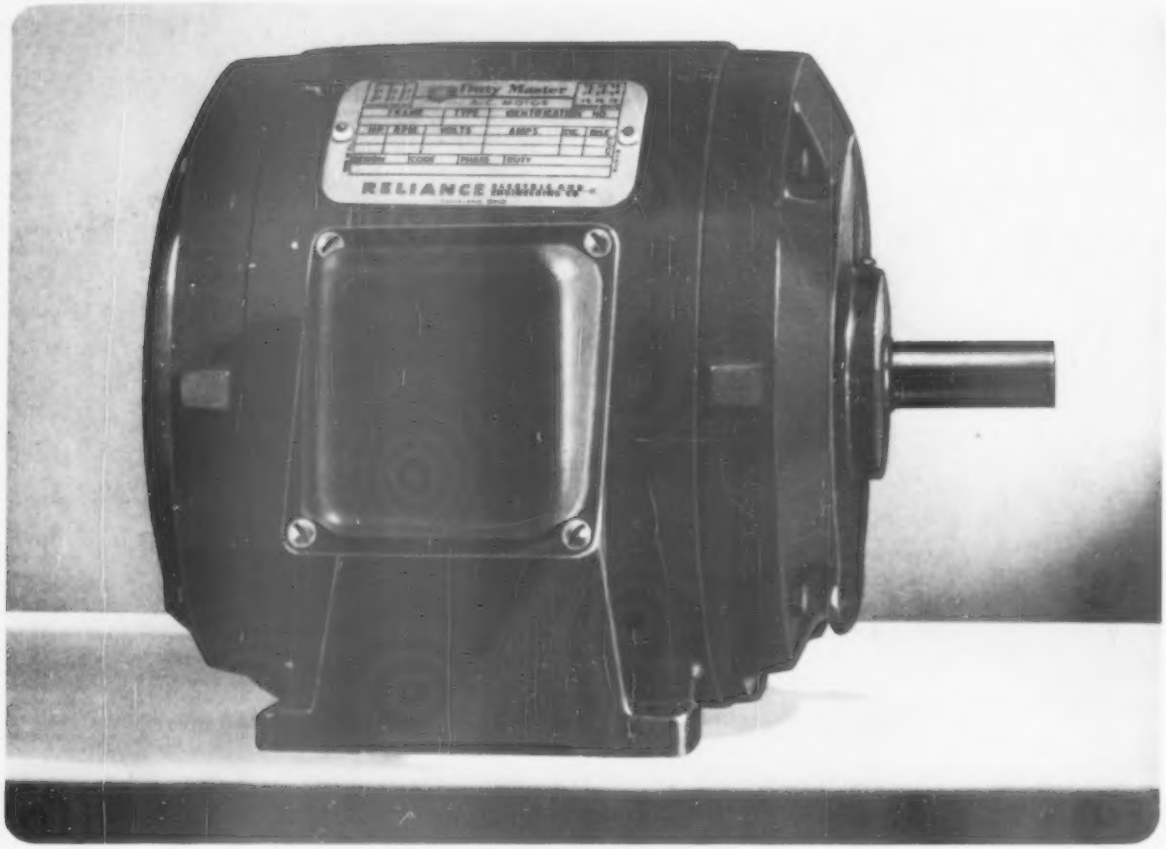
Write for the complete story Square D Company, 6060 Rivard Street, Detroit 11, Michigan

SQUARE D COMPANY

wherever electricity is distributed and controlled

* The QO in NQOB means QWIK-OPEN breakers—they trip instantly at 10 times full load rating. The B in NQOB means BOLTED CONNECTIONS. If you prefer plug-in construction, specify NQO

For more facts circle 447 on READER SERVICE CARD



Duty Master

a brand new a-c. motor

Product of Reliance Electric and Engineering Company and its Master Electric Division, Duty Master's new design gives users better protection from the inside out, simplified lubrication, better response and improved all around performance. The Duty Master line, from protected-open, to totally-enclosed, explosion-proof, 1 to 250 hp., is ready for delivery *NOW*.

Duty Master's insulation, by means of a series of multiple dips and bakes in thermosetting varnish plus final protection in finishing enamel, makes it resistant to water, acid, dirt and other contaminating elements . . . adds years to motor life.

"Metermatic" lubrication regulates flow of grease to the bearing—provides automatic grease relief. No danger of over-or under-lubrication . . . no maintenance headaches.

Duty Master's low inertia rotor has faster response in starting, stopping and reversing. This plus better ventilation and increased accelerating torques, permits frequent starts and stops without over-heating.

Duty Master's new design proves conclusively that all a-c. motors are *not* alike . . . that this new motor gives users the best value in industry today.

Call your Reliance Sales Engineer or distributor—write for Bulletin No. B-2106. B-1636-A

Product of the combined resources of Reliance Electric and Engineering Company and its Master and Reeves Divisions

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Duty Master A-c. Motors, Master Gearmotors, Reeves Drives, V*S Drives, Super 'T' D-c. Motors, Generators, Controls and Engineered Drive Systems.

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